

Introduction

This report, based on results from the National Status and Trends (NS&T) Program's Benthic Surveillance Project, summarizes metal and organic contaminant concentrations in fish and sediments found at 170 sites sampled from 1984 through 1992. The summary information presented in this report is meant to complement the many detailed studies being conducted by other Federal, state, and regional programs.

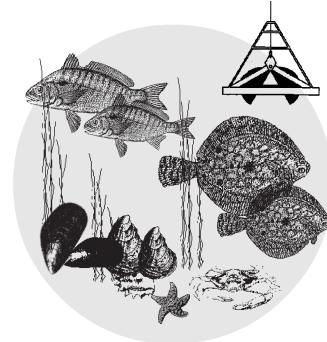
National Benthic Surveillance Project

• In order to determine the current status of and to detect any long-term trends in the environmental quality of U.S. nearshore waters, the National Oceanic and Atmospheric Administration (NOAA) initiated its National Status and Trends (NS&T) Program in 1984 with its National Benthic Surveillance Project (NBSP). The primary objective of the NBSP was to quantify concentrations of a suite of organic and inorganic contaminants in the livers of fish and surficial sediments from selected sites in the coastal and estuarine waters of the Atlantic, Gulf of Mexico, and Pacific coasts, including Alaska (Table 1). In addition, the levels of certain indicators of the biological effects of these contaminants were measured.

• The NBSP was conducted by components of NOAA's National Marine Fisheries Service (NMFS) with funding provided by the Coastal Monitoring and Bioeffects Assessment Division in NOAA's Office of Ocean Resources Conservation and Assessment and its

predecessor organization (i.e. Ocean Assessments Division). The NMFS's Northwest Fisheries Center was responsible for carrying out the NBSP on the Pacific Coast and the NMFS's Southeast Fisheries Center was responsible for carrying out this project along the southeast Atlantic Coast from Pamlico Sound, NC to the Mexican border. From 1984 to 1986 the NMFS's Northeast Fisheries Center conducted the NBSP from Chesapeake Bay north to the Canadian border. Beginning in 1987, the Northwest Fisheries Center assumed responsibility for that region and in 1988 the Northwest Fisheries Center assumed responsibility for the organic analyses for the southeast Atlantic Coast..

• In 1984, the first year, the NBSP collected fish and sediment samples at 46 sites around the coastal waters of the United States, including 2 sites in southeast Alaska. In 1985, a few additional sites were added between existing sites and 2 new sites were sampled along the Alaskan coast of the Beaufort Sea, bring the total to 53 sites sampled. In 1986, a total of 60 sites were sampled,



including 6 new sites along the Alaskan coast. The selection of monitoring sites was based on collecting samples from areas that would be representative of the body of water sampled, sites were not knowingly located near waste discharge points, local dump sites, or "hot spots".

• Up to 1987, the NBSP sampling strategy was to sample 50 so called "base line" sites annually. By 1987 it was evident that many of these "base line" sites, with relatively low levels of contamination, could be sampled less frequently (once every second year). This allowed for resources to be redirected towards more intensive sampling in areas found to have relatively high levels of contaminants and to add additional measurements for indicators of contaminant-related biological effects to the routine NBSP measurements. In 1987, 47 sites were sampled with intensive sampling in San Francisco Bay, San Diego Bay, Galveston Bay, St. Johns River, and Sapelo Sound. In 1988, 44 sites were sampled, with continued intensive sampling

DDT and its metabolites	Polycyclic aromatic hydrocarbons	Major elements
2,4'-DDD 4,4'-DDD 2,4'-DDE 4,4'-DDE 2,4'-DDT 4,4'-DDT	2-ring Biphenyl Naphthalene 1-Methylnaphthalene 2-Methylnaphthalene 2, 6-Dimethylnaphthalene 1,6,7-Trimethylnaphthalene	aluminum iron manganese silicon
Tetra, tri-, di-, and monobutyltins	3-ring Fluorene Phenanthrene 1-Methyphenanthrene	Trace elements
Chlorinated pesticides other than DDT	Anthracene Acenaphthene Acenaphthylene	antimony arsenic cadmium chromium copper lead
Aldrin <i>cis</i> -Chlordane <i>trans</i> -Nonachlor Dieldrin Heptachlor Heptachlor epoxide Hexachlorobenzene Lindane (gamma-HCH) Mirex	4-ring Fluoranthene Pyrene Benz[a]anthracene Chrysene	mercury nickel selenium silver tin zinc
Polychlorinated biphenyls	5-ring Benz[a]pyrene Benz[e]pyrene Perylene Dibenz[a,h]anthracene Benz[b]fluoranthene Benz[k]fluoranthene	
PCB congeners 18, 28, 44, 52, 66, 101, 105, 118, 128, 138, 153, 179, 180, 187, 195, 206, 209 and/or Di, Tri, Tetra, Penta, Hexa, Hepta, Octa, Nona, and Decachlorobiphenyls	6-ring Benz[gh]perylene Indeno[1,2,3-cd]pyrene	
Toxaphene at some sites	Related parameters Grain Size Total Organic Carbon (TOC) <i>Clostridium perfringens</i> spores	

Table 1. List of NS&T chemicals

in San Francisco, San Diego, and Galveston Bays. In 1989 and 1990, 46 and 51 sites, respectively were sampled with intensive sampling in Boston and New York Harbors and along the Southern California coast near Los Angeles for both years. By 1992, 170 different sites had been sampled at least once (Figure 1).

In most cases, a site consisted of three stations, with each station providing separate sample material for organic and trace element analysis. Fish were collected primarily using otter trawls. On occasion, especially along the Southeast and Gulf Coasts, fish were taken with hook and line, or with gill nets. Due to the variable number of trawls required to collect samples with appropriate numbers of fish within the defined size range, a nominal site center was defined for all NBSP sites (Lauenstein et al., 1993). The chemical analyses were generally carried out on three composite samples of 10-20 fish livers each. In order to compare the chemical concentration data

over the largest geographic area, attempts were initially made to limit the number of fish species targeted for collection and analyses in the different regions of the country. However, due to differing availability of the targeted species among years at various sites and an effort to find indicator species, 30 species were collected and analyzed at one time or another. As a result, some sites have two or more species associated with them (Figure 1 illustrates the selected primary targeted species for each region).

Chemical measurements were made on liver tissue rather than edible flesh or whole fish because livers concentrate many contaminants, making concentrations more easily determinable. Livers were also examined in an attempt to determine the potential contaminant related health effects. For many organic compounds, fish livers are a more sensitive indicator of the chemical levels in the fish's surrounding environment. This is not the case with polycyclic aromatic hydrocarbons (PAH's), which are rapidly metabolized in fish livers. For these compounds, a more sensitive measure of environmental exposure was provided by measuring the concentrations of fluorescent aromatic metabolites in the fish bile.

Sediment was collected at three stations within a site, a station being anywhere within 500 meters (m) of a site center. In the Northeast from 1984 to 1986, stations were up to approximately 5 (km) apart, so that in effect, a site could be 100 times larger than that for the other NBSP sites (NOAA, 1988). Contaminant concentrations in sediments for this report are given based on percent dry weight. Sediment grabs were generally taken at or near the center of the fish trawls. Sediments were collected using a Smith-MacIntyre bottom grab, box corer, or Van Veen grab sampler. Sub samples for chemical analyses were taken from the top 1-2 centimeters (cm) of each grab or core. Composites for each station were made by combining surficial samples taken from the three cores or grabs, and in turn, three composites (one from each station) were analyzed per site per year. Shigenaka and Lauenstein (1988) provide detailed sampling protocols for the

Figure 1. NS&T Program Benthic Surveillance Project monitoring sites (1984-1992) and selected primary species.



NBSP (Figure 2 illustrates the NBSP sampling strategy).

Contaminants measured were selected based on the Environmental Protection Agency's (EPA) list of priority pollutants and were chosen in order to compare NBSP results with earlier EPA studies. Over the length of the NBSP, changes occurred in the list of measured contaminants. In 1988, analyses for antimony in tissue (but not in sediments) and thallium in both tissue and sediment were dropped because these elements were very seldom found at detectable levels. In that same year, analyses for six additional PAH compounds (acenaphthylene, 1,6,7-trimethylnaphthalene, benzo(b) and benzo(k) fluoranthene, indeno(1,2,3-cd)

pyrene, and benzo(ghi)perylene) were added. In 1989, analyses for mono-, di-, and tributyltins in sediments were added as concern mounted regarding the effects of these antifouling compounds on the organisms in certain U.S. estuarine areas and as control measures were put in place to decrease the input of these substances to coastal waters.

From its inception, the NBSP not only monitored chemical concentrations of toxic contaminants in fish, but indicators of contaminant-associated disease in fish as well. Incidences of visible lesions, including fin erosion, have been noted and histopathological examinations of various tissues have been carried out. Originally, the histo-

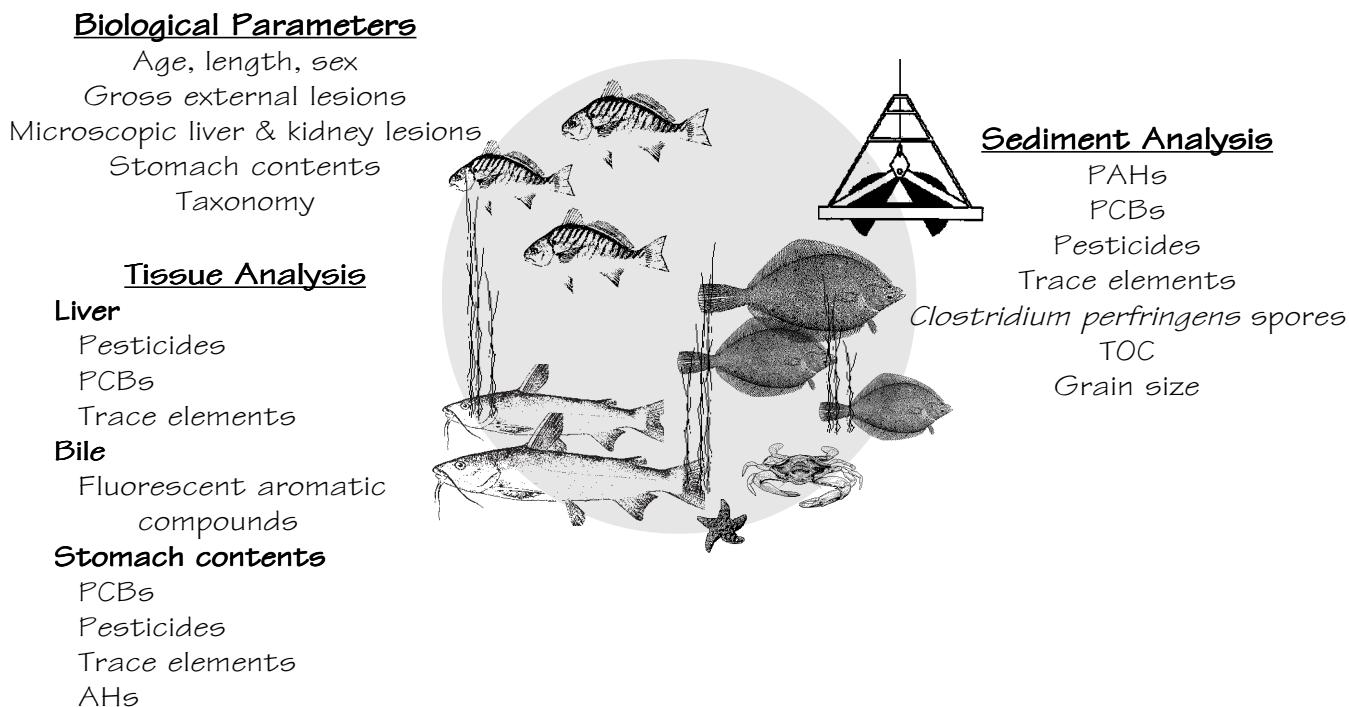


Figure 2. NS&T Program Benthic Surveillance Project monitoring strategy.

pathological examinations determined the prevalence of any identifiable disease conditions in samples of liver, kidney, and gill tissue. Beginning in 1987, examinations became more focused on determining the prevalence of necrotic and proliferative lesions in the liver (Johnson et al., 1992). When abnormal tissues were noted during necropsy, additional tissues were sampled (e.g., kidney, heart, spleen, and lower intestine) for a more detailed examination.

As the NBSP progressed and more reliable indicators of contaminant exposure and effects were identified, the focus of the project shifted from chemical quantification to one of identification and quantification of biological properties related to the effects of contaminants (Varanasi et al., 1992). For example, mixed function oxygenase (MFO) enzyme levels in fish livers were added because they have been shown to be valuable indicators of the exposure and response of the fish to toxic organic contaminants. Measurements of the activities of the MFO's aryl hydrocarbon hydroxylase (AHH) and ethoxyresorufin-O-deethylase (EROD) were initiated for fish from selected

sites in 1988 and 1989 respectively. In 1991, measurements of these enzyme activities were expanded to include fish from all sampled sites. Also in 1991, measurements of xenobiotic-DNA adducts, which result from reactions of xenobiotic metabolites with DNA and are an indicator of genetic damage, were added for fish sampled at 30 sites.

An essential part of any monitoring effort is the quality of the data collected. The NS&T Program's monitoring efforts have been overseen by the performance-based Quality Assurance (QA) Project, which was designed to document sampling protocols, analytical procedures, laboratory performance, and to reduce intralaboratory and interlaboratory variation. This project has ensured that, despite differences in analytical methodologies used, there exists comparability among data sets. Cantillo and Lauenstein (1993) detail the NS&T QA Project. The methods used by the various laboratories involved in the NS&T Program are documented by Lauenstein and Cantillo (1993).

The following tables provide elemental and organic concentrations found in fish livers and associated sediments at all NBSP sites sampled between 1984 and 1992. The metals tables list data for silver, arsenic, cadmium, chromium, copper, mercury, nickel, lead, selenium, tin, and zinc. The organics tables provide data for total DDT (sum of 2,4'-DDD, 4,4'-DDD, 2,4'-DDE, 4,4'-DDE, 2,4'-DDT, 4,4'-DDT), total dieldrin (sum of aldrin and dieldrin), total chlordane (sum of *cis*-chlordane, *trans*-nonachlor, heptachlor, and heptachlorepoxyde), hexachlorobenzene, lindane, mirex, and total PCB (sum of chlorination levels). In addition, total PAH (sum of 24 compounds) are given in the sediment tables and tFAC (measured in fish bile and given as the sum of aromatic compounds fluorescing at benzo(a)pyrene and naphthalene wavelengths) are listed in the liver tables. Means for each year were calculated from that years replicate data for each site. Each replicate was treated as an individual sample. Reported concentrations below the limit of quantification have been reported as zero and treated as such in the calculation of the means and standard deviations. Detection limits are available on ORCA's Internet Information Service (<http://seaserver.nos.noaa.gov/projects/nsandt/nsandt.html>) or from Lauenstein and Cantillo eds. (1993). The overall site average and standard deviation were calculated using the replicate data for all years that site was sampled. Because of this, the overall site average may not exactly match an average calculated from the yearly means provided in the tables. The tables in Appendix One provide the data by each species sampled as opposed to by site. The means were calculated in the same manner as the site tables.

References

- Cantillo, A.Y. and G.G. Lauenstein. 1993. Performance based quality assurance of the NOAA National Status and Trends Program. In: Parkany M, (ed) Quality Assurance for Analytical Laboratories. Royal Society of Chemistry, Cambridge, UK. pp 34-43.
- Hanson, P.J. and D.W. Evans. 1991. Metal Contaminant Assessment for the Southeast Atlantic and Gulf of Mexico Coasts: Results of the National Benthic Surveillance Project Over the First Four Years 1984-1987. NOAA Technical Memorandum NMFS-SEFSC-284, 120p.
- Johnson, L.L., C.M. Stehr, O.P. Olson, M.S. Myers, S.M. Pierce, B. B. McCain, and U. Varanasi. 1992. National Status and Trends Program, Benthic Surveillance Project: Northeast coast, fish histopathology and relationships between lesions and chemical contaminants (1987-89). National Oceanic and Atmospheric Administration, National Marine Fisheries Service. Tech. Memo. NMFS-NWFSC-4. 96pp.
- Krahn, M.M., L.D. Rhodes, M.S. Myers, L.K. Moore, W.D. MacLeod, and D.C. Malins. 1986. Associations between metabolites of aromatic compounds in bile and the occurrence of hepatic lesions in English sole (*Parophrys vetulus*) from Puget Sound, Washington. Arch. Environ. Contam. Toxicol. 15:61-67.
- Lauenstein, G.G., M.R. Harmon and B.W. Gottholm. 1993. National Status and Trends Program: Monitoring Site Descriptions (1984-1990) for the National Mussel Watch and Benthic Surveillance Projects. Tech Memo NOSORCA 70. NOAA/NOS/ORCA, Silver Spring, MD.
- Lauenstein, G.G. and A.Y. Cantillo (eds). 1993. Sampling and analytical methods of the NOAA National Status and Trends Program, National Benthic Surveillance and Mussel Watch Projects 1984-1992: Vol. I-IV. Tech memo NOS ORCA 71. NOAA/NOS/ORCA, Silver Spring, MD.
- National Oceanic and Atmospheric Administration. 1988. National Status and Trends Program: a summary of selected data on chemical contaminants in sediments collected during 1984, 1985, 1986, and 1987. U.S. Department of Commerce, NOAA Technical Memorandum 44. NOS/OMA Silver Spring, MD. 22pp.
- Shigenaka, G. and G.G. Lauenstein. 1988. National Status and Trends Program for marine environmental quality: Benthic Surveillance and Mussel Watch Projects sampling protocols. U.S. Dept. Commerce, NOAA Technical Memorandum NOS OMA 40. 12pp.
- Varanasi, U., J.E. Stein, L.L. Johnson, T.K. Collier, E. Casillas, and M.S. Myers. 1992. Evaluation of bioindicators of contaminant exposure and effects in coastal ecosystems, pp. 461-498. In: Ecological Indicators, Volume 1 (D.H. McKenzie, D.E. Hyatt, and V.J. McDonald eds.). Elsevier Applied Science. London.

North Atlantic Estuaries

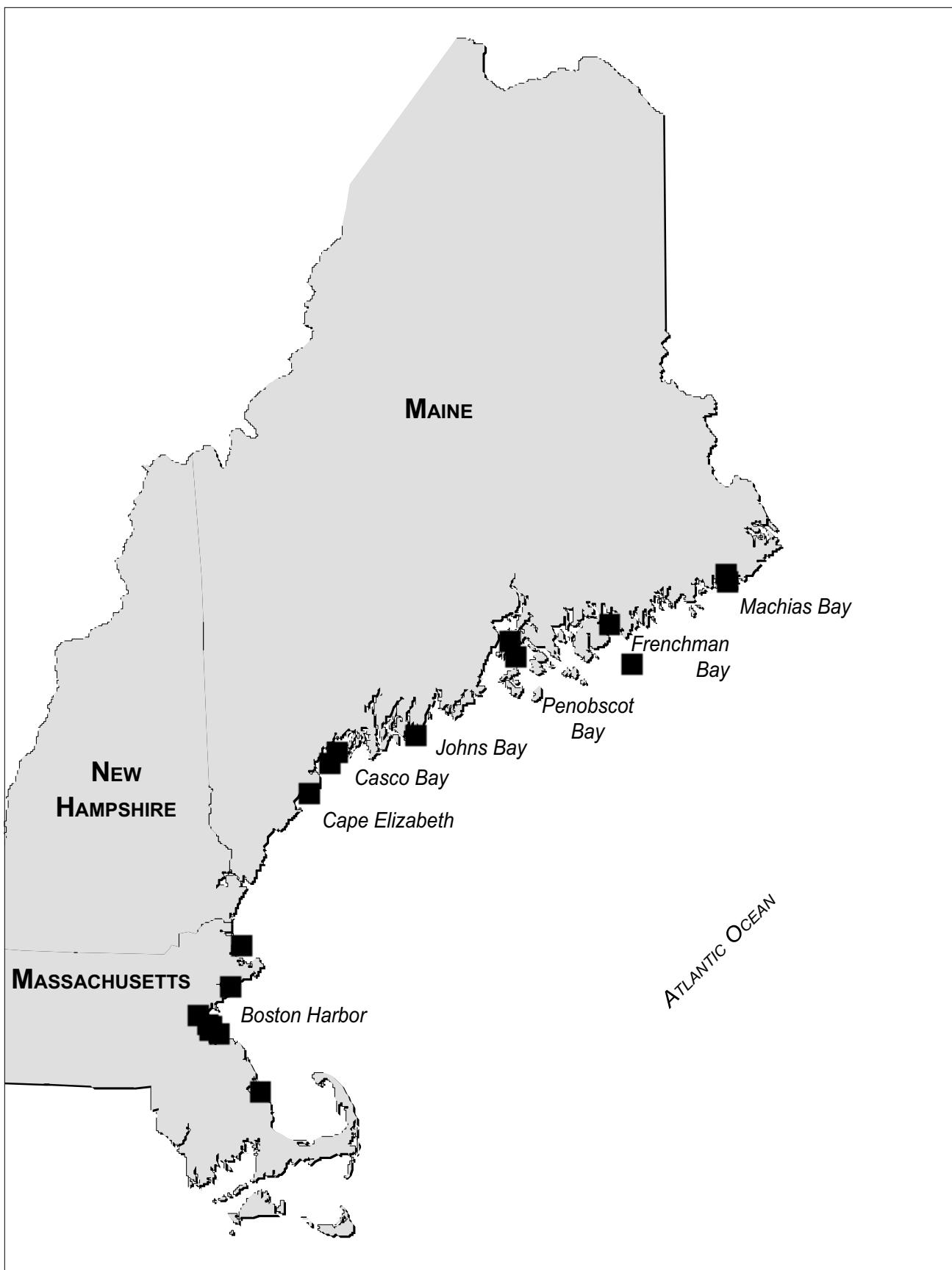


Figure 3. NS&T Program Benthic Surveillance Project monitoring sites (North Atlantic Estuaries).

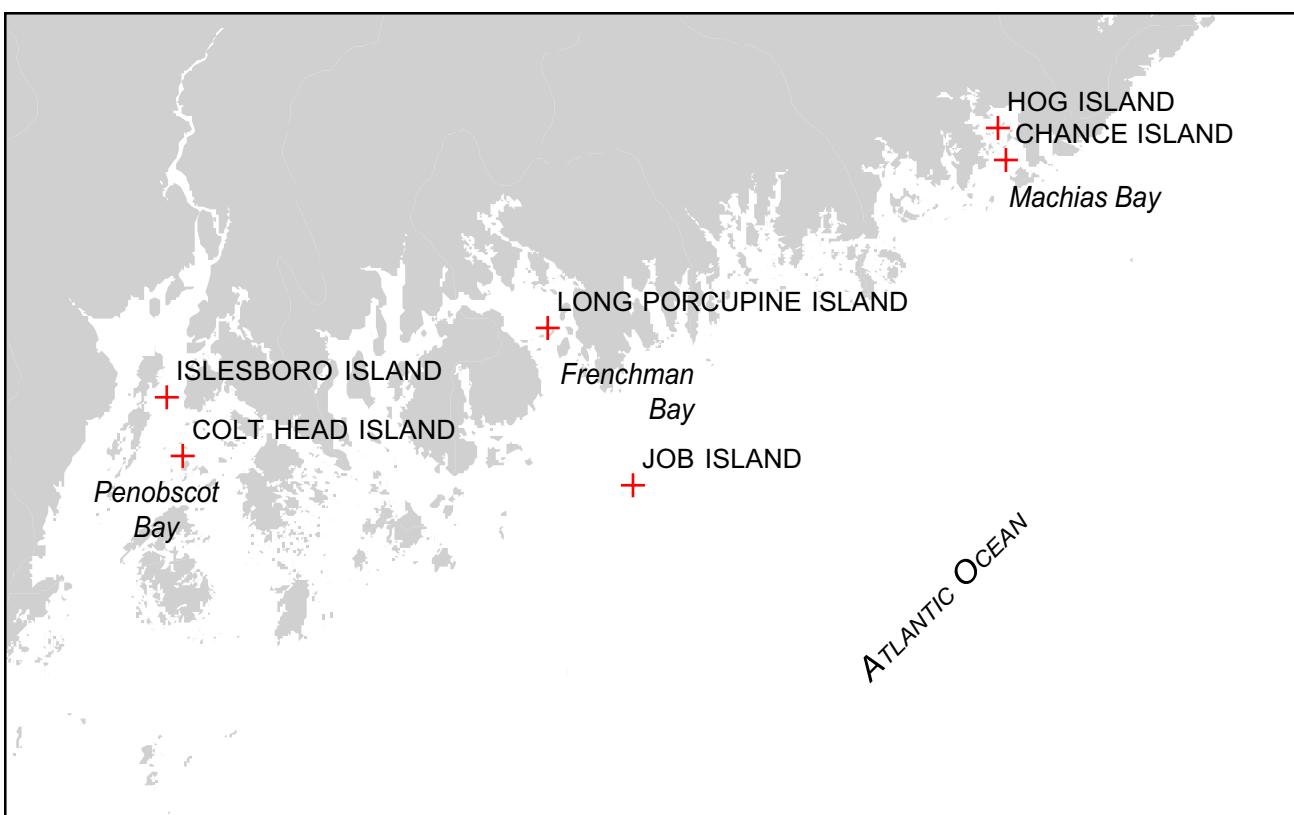


Figure 4a. Hog Island to Islesboro Island.

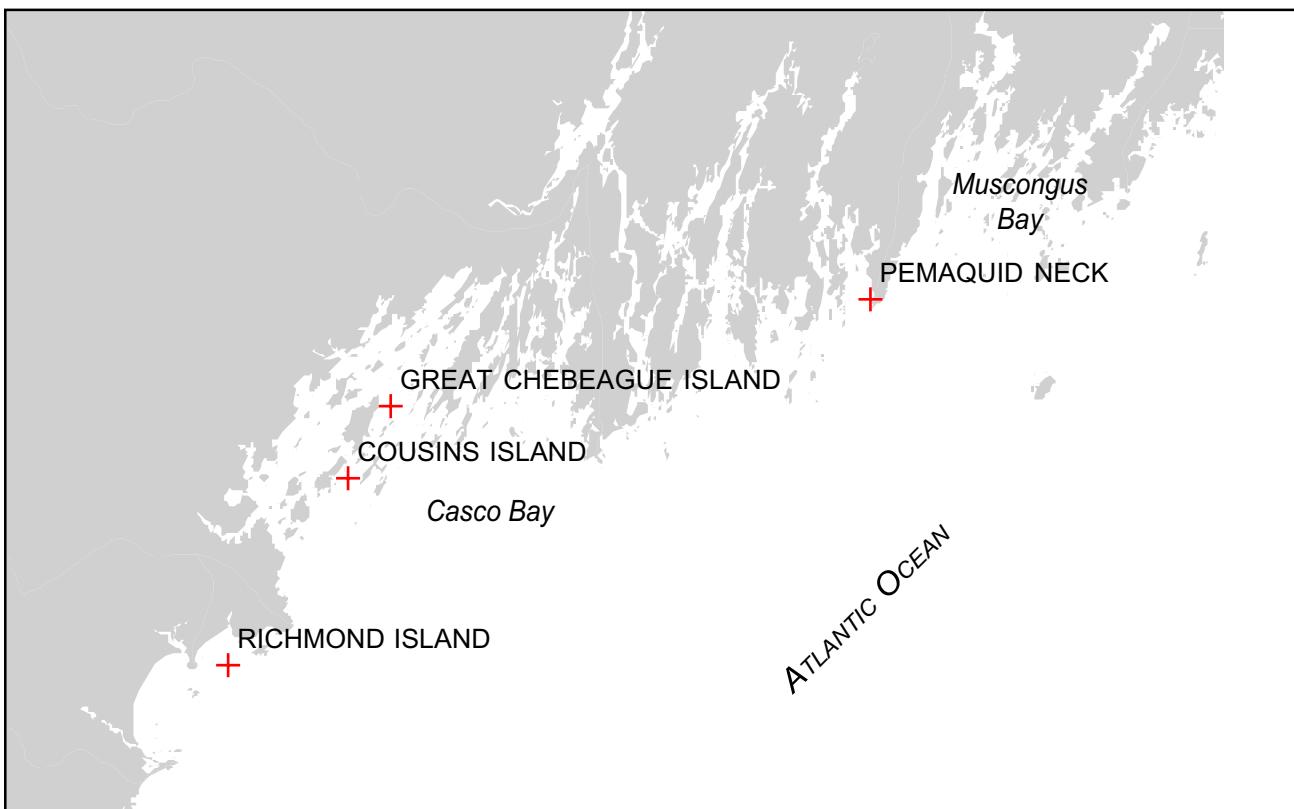


Figure 4b. Pemaquid Island to Cape Elizabeth.

Table 2a - North Atlantic Estuaries

NS&T BSP Fish and Sediment Site Sampling Years

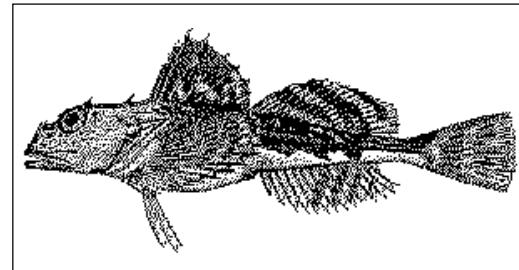
General Site Name	Site Code	Specific Site Name	Species	Fish	Sediment
Maine					
Machias Bay	MACHI	Hog Island	Ihs	87	87
Machias Bay	MACCI	Chance Island	Ihs	85 86 87	84 85 86 89
Frenchmans Bay	FRNLP	Long Porcupine Island	Ihs	85	85 86
Penobscot Bay	PNBJI	Job Island	Ihs	87	87
Penobscot Bay	PNBCH	Colt Head Island	Ihs	85 86	
Penobscot Bay	PNBCH	Colt Head Island	wf		
Penobscot Bay	PNBCH	Colt Head Island			85 86
Johns Bay	JONPN	Pemaquid Island	wf		
Johns Bay	JONPN	Pemaquid Island	wpf		
Johns Bay	JONPN	Pemaquid Island			90 91
Casco Bay	CASGC	Great Chebeague Island	wf	84	
Casco Bay	CASGC	Great Chebeague Island	Ihs	85 86	
Casco Bay	CASGC	Great Chebeague Island			84 85 86
Casco Bay	CASCI	Cousins Island	Ihs	87	87 89
Cape Elizabeth	CAPRI	Richmond Island	wf		
Cape Elizabeth	CAPRI	Richmond Island	wpf		91
Cape Elizabeth	CAPRI	Richmond Island			90 91

North Atlantic Estuaries



General Location Machias Bay
Specific Site Name Hog Island
NS&T Site Code MACHI
Nominal Site Center 44° 40.6' N
67° 20.7' W

Species *Myoxocephalus octodecemspinosus*
[longhorn sculpin]



FISH DATA - Metals ($\mu\text{g/g}$ dry weight)

ELEMENTS	Ag	As	Cd	Cr	Cu	Hg	Ni	Pb	Se	Sn	Zn
1984											
1985											
1986											
1987	0.95	9.57	4.51	0.85	8.24	0.24	0.38	0.67	7.07	0.02	192.00
1988											
1989											
1990											
1991											
1992											
AVERAGE	0.95	9.57	4.51	0.85	8.24	0.24	0.38	0.67	7.07	0.02	192.00
STDEV											

Description

The site is located 0.3 nautical miles west of Hog Island; 0.6 nautical miles northeast of Round Island; and 0.8 nautical miles southeast of Holmes Point on the mainland.

Sediment Locations

<u>Sample Year</u>	<u>Station</u>	<u>Latitude (N)</u>	<u>Longitude (W)</u>
1987	A	44° 38.0'	67° 20.1'
1987	B	44° 40.6'	67° 20.7'
1987	C	44° 38.9'	67° 20.6'

SEDIMENT DATA - Metals (µg/g dry weight)

ELEMENTS	Ag	As	Cd	Cr	Cu	Hg	Ni	Pb	Se	Sn	Zn
1984											
1985											
1986											
1987	0.13	5.9		122.64	9.02		15.23	21.37	0.25	3.03	50.67
1988											
1989											
1990											
1991											
1992											
AVERAGE	0.13	5.9		122.64	9.02		15.23	21.37	0.25	3.03	50.67
STDEV											

SEDIMENT DATA - Organics (ng/g dry weight)

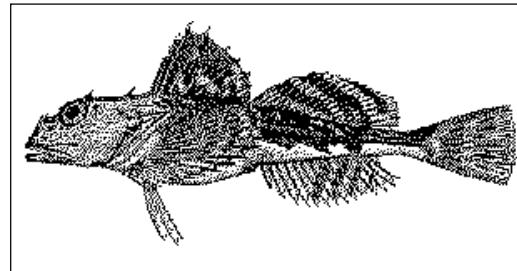
COMPOUND	tDDT	TDieldrin	tC dane	Hexachl	Lindane	Mirex	tPCB	tPAH
1984								
1985								
1986								
1987	0.00	0.00	0.13	0.53	0.00	0.00	24.07	132.20
1988								
1989								
1990								
1991								
1992								
AVERAGE	0.00	0.00	0.13	0.53	0.00	0.00	24.07	132.20
STDEV								



General Location
Specific Site Name
NS&T Site Code
Nominal Site Center

Machias Bay
 Chance Island
 MACCI
 44° 38.0' N
 67° 20.0' W

Species *Myoxocephalus octodecemspinosus*
 [longhorn sculpin]



FISH DATA - Metals ($\mu\text{g/g}$ dry weight)

ELEMENTS	Ag	As	Cd	Cr	Cu	Hg	Ni	Pb	Se	Sn	Zn
1984											
1985	0.51	17.49	3.02	0.23	11.13	0.20	0.21	0.34	5.77	0.28	121.72
1986	0.68	12.34	4.65	0.10	16.24	0.44	0.22	0.16	4.98		160.42
1987											
1988											
1989											
1990											
1991											
1992											
AVERAGE	0.60	14.92	3.83	0.16	13.68	0.32	0.22	0.25	5.37	0.28	141.07
STDEV	0.12	3.64	1.15	0.09	3.61	0.17	0.01	0.13	0.56		27.37

FISH DATA - Organics (ng/g dry weight; ng/g wet weight for tFAC)

COMPOUND	tDDT	TDieldrin	tC dane	Hexachl	Lindane	Mirex	tPCB	tFAC
1984								
1985	162.67	13.00	55.00	3.33	4.33	5.00	375.00	8395.50
1986	188.22	14.35	44.38	4.81	1.91	3.34	411.73	12529.57
1987	134.67	2.67	36.00	9.67	0.00	5.67	568.00	
1988								
1989								
1990								
1991								
1992								
AVERAGE	175.44	13.67	49.69	4.07	3.12	4.17	393.37	10462.53
STDEV	18.07	0.95	7.51	1.04	1.72	1.18	25.97	2923.23

Description

The site is located 0.8 nautical miles southwest of Chance Island; 1.4 nautical miles north of Northwest Head on Cross Island; and 1.3 nautical miles south of Avery Rock near the geographic center of Machias Bay.

Sediment Locations

<u>Sample Year</u>	<u>Station</u>	<u>Latitude (N)</u>	<u>Longitude (W)</u>
1984	MB1	44° 38.0'	67° 20.1'
1985	MB1	44° 38.0'	67° 20.1'
1985	MB2	44° 38.2'	67° 19.1'
1985	MB3	44° 40.7'	67° 20.8'
1985	MB4	44° 38.8'	67° 20.7'
1986	MB1	44° 38.0'	67° 20.1'
1986	MB3	44° 40.7'	67° 20.8'
1986	MB4	44° 38.8'	67° 20.7'
1989	A	44° 38.0'	67° 19.1'
1989	B	44° 38.3'	67° 19.2'
1989	C	44° 38.6'	67° 19.5'

SEDIMENT DATA - Metals (µg/g dry weight)

ELEMENTS	Ag	As	Cd	Cr	Cu	Hg	Ni	Pb	Se	Sn	Zn
1984	0.04	8.56	0.06	80.4	11.3		20.6	17.7	0.12	2.58	54
1985	0.05	7.97	0.07	70.2	10.57		20.5	20.93		2.24	57.1
1986	0.04	6.82	0.07	50.1	10.79	0.03	20.9	18.83		1.52	51
1987											
1988											
1989	0.11	8.22	0.11	66.13	11.85	0.06	23.06	19.61	0.17	1.98	60
1990											
1991											
1992											
AVERAGE	0.06	7.89	0.08	66.71	11.13	0.05	21.26	19.27	0.14	2.08	55.52
STDEV	0.03	0.75	0.02	12.59	0.57	0.02	1.21	1.36	0.03	0.45	3.88

SEDIMENT DATA - Organics (ng/g dry weight)

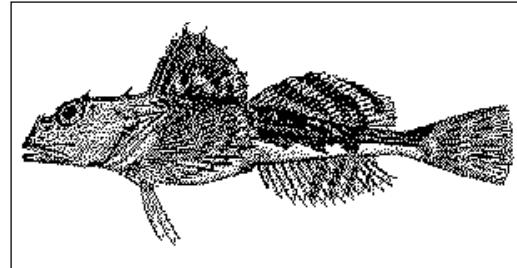
COMPOUND	tDDT	TDieldrin	tC dane	Hexachl	Lindane	Mirex	tPCB	tPAH
1984								
1985	0.68	0.18	0.10	0.68	0.50	0.00	14.80	337.39
1986	0.36	0.35	1.20	0.04	0.53	0.00	36.00	104.67
1987								
1988								
1989								
1990								
1991								
1992								
AVERAGE	0.52	0.26	0.65	0.36	0.51	0.00	25.40	221.03
STDEV	0.23	0.12	0.78	0.45	0.02	0.00	14.99	164.56



General Location
Specific Site Name
NS&T Site Code
Nominal Site Center

Frenchman Bay
 Long Porcupine Island
 FRNLP
 44° 25.0' N
 68° 10.0' W

Species *Myoxocephalus octodecemspinosus*
 [longhorn sculpin]



FISH DATA - Metals ($\mu\text{g/g}$ dry weight)

ELEMENTS	Ag	As	Cd	Cr	Cu	Hg	Ni	Pb	Se	Sn	Zn
1984											
1985	0.13	5.35	0.31	0.20	5.07	0.05	0.35	0.24	3.53	0.38	82.79
1986											
1987											
1988											
1989											
1990											
1991											
1992											
AVERAGE	0.13	5.35	0.31	0.20	5.07	0.05	0.35	0.24	3.53	0.38	82.79
STDEV											

FISH DATA - Organics (ng/g dry weight; ng/g wet weight for tFAC)

COMPOUND	tDDT	TDieldrin	tC dane	Hexachl	Lindane	Mirex	tPCB	tFAC
1984								
1985	167.33	17.67	55.67	2.33	5.00	5.00	352.67	17699.91
1986								
1987								
1988								
1989								
1990								
1991								
1992								
AVERAGE	167.33	17.67	55.67	2.33	5.00	5.00	352.67	17699.91
STDEV								

Description

The site is located 0.2 nautical miles north of Long Porcupine Island; 2.0 nautical miles southeast of the C "9" channel marker near Bald Rock; and 1.3 nautical miles southwest of Stave Island.

Sediment Locations

<u>Sample Year</u>	<u>Station</u>	<u>Latitude (N)</u>	<u>Longitude (W)</u>
1985	FB1	44° 26.8'	68° 13.3'
1985	FB2	44° 26.5'	68° 10.4'
1985	FB3	44° 23.0'	68° 09.9'
1985	FB4	44° 19.0'	68° 08.1'
1986	FB1	44° 26.8'	68° 13.3'
1986	FB2	44° 26.5'	68° 10.4'
1986	FB3	44° 23.0'	68° 09.9'

SEDIMENT DATA - Metals (µg/g dry weight)

ELEMENTS	Ag	As	Cd	Cr	Cu	Hg	Ni	Pb	Se	Sn	Zn
1984											
1985	0.09	10	0.16	90.1	16.57	0.02	31.9	26.1	0.42	4.02	102.9
1986	0.09	10.67	0.2	75.83	17.7	0.09	48.57	29.7		3.48	102
1987											
1988											
1989											
1990											
1991											
1992											
AVERAGE	0.09	10.34	0.18	82.97	17.13	0.05	40.23	27.90	0.42	3.75	102.45
STDEV	0.00	0.47	0.03	10.09	0.80	0.05	11.79	2.55		0.38	0.64

SEDIMENT DATA - Organics (ng/g dry weight)

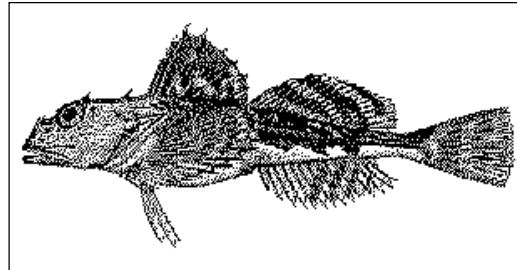
COMPOUND	tDDT	TDieldrin	tC dane	Hexachl	Lindane	Mirex	tPCB	tPAH
1984								
1985	0.00	0.00	0.25	0.95	0.50	0.00	9.78	320.84
1986	2.27	3.86	1.47	0.56	0.00	0.00	48.03	149.14
1987								
1988								
1989								
1990								
1991								
1992								
AVERAGE	1.14	1.93	0.86	0.76	0.25	0.00	28.90	234.99
STDEV	1.61	2.73	0.87	0.27	0.35	0.00	27.05	121.41



General Location
Specific Site Name
NS&T Site Code
Nominal Site Center

Penobscot Bay
 Job Island
 PNBJI
 $44^{\circ}12.8' \text{ N}$
 $69^{\circ}00.7' \text{ W}$

Species *Myoxocephalus octodecemspiniferus*
 [longhorn sculpin]



FISH DATA - Metals ($\mu\text{g/g}$ dry weight)

ELEMENTS	Ag	As	Cd	Cr	Cu	Hg	Ni	Pb	Se	Sn	Zn
1984											
1985											
1986											
1987	0.75	6.57	2.90	0.77	9.43	0.42	0.22	0.60	6.10	0.06	125.33
1988											
1989											
1990											
1991											
1992											
AVERAGE	0.75	6.57	2.90	0.77	9.43	0.42	0.22	0.60	6.10	0.06	125.33
STDEV											

FISH DATA - Organics (ng/g dry weight; ng/g wet weight for tFAC)

COMPOUND	tDDT	TDieldrin	tC dane	Hexachl	Lindane	Mirex	tPCB	tFAC
1984								
1985								
1986								
1987	182.33	8.67	50.33	10.00	3.67	3.67	1226.00	
1988								
1989								
1990								
1991								
1992								
AVERAGE	182.33	8.67	50.33	10.00	3.67	3.67	1226.00	
STDEV								

Description

The site is located 2.2 nautical miles west of Job Island; 1.1 nautical miles south of the Dillingham Ledge buoy; and 2.2 nautical miles east of the Curtis Island marker.

Sediment Locations

<u>Sample Year</u>	<u>Station</u>	<u>Latitude (N)</u>	<u>Longitude (W)</u>
1987	A	44° 24.4'	68° 53.2'
1987	B	44° 12.8'	69° 00.7'
1987	C	44° 10.1'	68° 46.5'

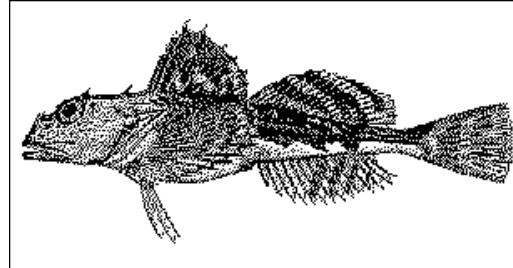
SEDIMENT DATA - Metals (µg/g dry weight)

ELEMENTS	Ag	As	Cd	Cr	Cu	Hg	Ni	Pb	Se	Sn	Zn
1984											
1985											
1986											
1987	0.24	11.29		329.93	17.7	0.07	24.8	28.43	0.86	4.4	109.53
1988											
1989											
1990											
1991											
1992											
AVERAGE	0.24	11.29		329.93	17.7	0.07	24.8	28.43	0.86	4.4	109.53
STDEV											



General Location Penobscot Bay
Specific Site Name Colt Head Island
NS&T Site Code PNBCH
Nominal Site Center 44°15.0' N
 68°50.0' W

Species *Myoxocephalus octodecemspinosis*
 [longhorn sculpin]



FISH DATA - Metals ($\mu\text{g/g}$ dry weight)

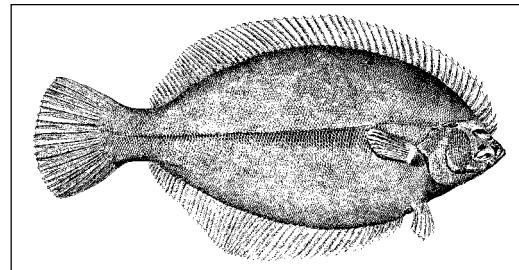
ELEMENTS	Ag	As	Cd	Cr	Cu	Hg	Ni	Pb	Se	Sn	Zn
1984											
1985	0.13	9.19	0.72	0.12	4.72	0.20	0.10	0.56	3.50		76.83
1986	0.28	7.30	2.70	0.58	10.50	0.38	0.33	0.16	4.18	0.08	161.89
1987											
1988											
1989											
1990											
1991											
1992											
AVERAGE	0.20	8.24	1.71	0.35	7.61	0.29	0.22	0.36	3.84	0.08	119.36
STDEV	0.11	1.33	1.40	0.33	4.09	0.13	0.16	0.28	0.48		60.14

FISH DATA - Organics (ng/g dry weight; ng/g wet weight for tFAC)

COMPOUND	tDDT	TDieldrin	tC dane	Hexachl	Lindane	Mirex	tPCB	tFAC
1984								
1985	217.00	19.33	55.00	2.00	6.33	4.00	1069.00	11962.00
1986	193.16	32.10	50.99	5.20	3.94	6.20	1077.08	5053.50
1987								
1988								
1989								
1990								
1991								
1992								
AVERAGE	205.08	25.72	53.00	3.60	5.14	5.10	1073.04	8507.75
STDEV	16.86	9.03	2.84	2.26	1.69	1.55	5.71	4885.04

General Location Penobscot Bay
Specific Site Name Colt Head Island
NS&T Site Code PNBCH
Nominal Site Center 44° 15.0' N
68° 50.0' W

Species *Pleuronectes americanus*
[winter flounder]



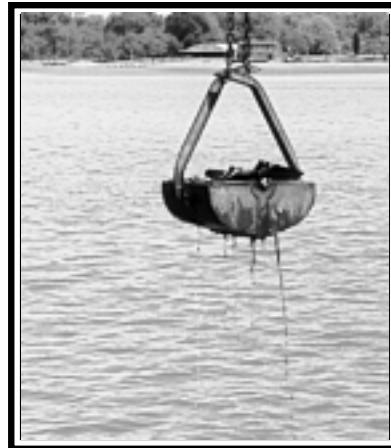
FISH DATA - Organics (ng/g dry weight; ng/g wet weight for tFAC)

COMPOUND	tDDT	TDieldrin	tCdane	Hexachl	Lindane	Mirex	tPCB	tFAC
1984								
1985								
1986								
1987								
1988								
1989								
1990								167966.00
1991								
1992								
AVERAGE								167966.00
STDEV								



General Location
Specific Site Name
NS&T Site Code

Penobscot Bay
 Colt Head Island
 PNBCH



Description

The site is located 0.5 nautical miles to the north of Colt Head Island; 2.2 nautical miles south southwest of the R "2" BELL buoy near Western Island; and 0.6 nautical miles southwest of Beach Island.

Sediment Locations

<u>Sample Year</u>	<u>Station</u>	<u>Latitude (N)</u>	<u>Longitude (W)</u>
1985	PB1	44° 24.4'	68° 53.3'
1985	PB2	44° 19.2'	68° 52.0'
1985	PB3	44° 12.7'	69° 00.7'
1985	PB4	44° 10.0'	68° 46.6'
1985	PB5	44° 07.7'	68° 58.4'
1986	PB1	44° 24.4'	68° 53.3'
1986	PB3	44° 12.7'	69° 00.7'
1986	PB4	44° 10.0'	68° 46.6'

SEDIMENT DATA - Metals (µg/g dry weight)

ELEMENTS	Ag	As	Cd	Cr	Cu	Hg	Ni	Pb	Se	Sn	Zn
1984											
1985	0.1	11.28	0.11	106.07	19.23	0.17	32.6	28.53	0.48	3.87	113.67
1986	0.12	10.96	0.14	94.6	19.8	0.25	40.77	33.63		3.71	118
1987											
1988											
1989											
1990											
1991											
1992											
AVERAGE	0.11	11.12	0.12	100.33	19.52	0.21	36.68	31.08	0.48	3.79	115.83
STDEV	0.01	0.23	0.02	8.11	0.40	0.06	5.77	3.61		0.11	3.06

SEDIMENT DATA - Organics (ng/g dry weight)

COMPOUND	tDDT	TDieldrin	tC dane	Hexachl	Lindane	Mirex	tPCB	tPAH
1984								
1985	0.80	0.00	0.38	1.60	0.00	0.00	32.06	635.95
1986	8.95	2.17	3.29	1.32	1.98	0.40	86.57	1032.86
1987								
1988								
1989								
1990								
1991								
1992								
AVERAGE	4.88	1.08	1.83	1.46	0.99	0.20	59.31	834.41
STDEV	5.77	1.53	2.06	0.20	1.40	0.29	38.54	280.66

**General Location**

Johns Bay

Specific Site Name

Pemaquid Neck

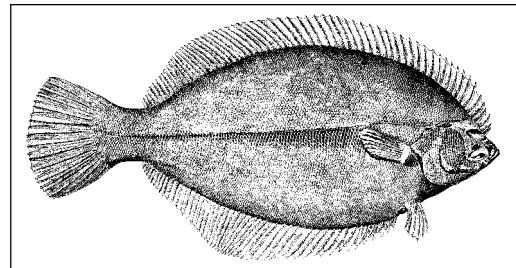
NS&T Site Code

JONPN

Nominal Site Center

43° 50.5' N

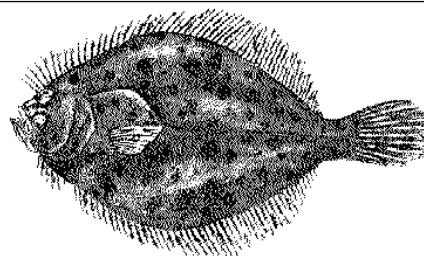
69° 31.2' W

Species*Pleuronectes americanus*
[winter flounder]**FISH DATA - Organics (ng/g dry weight; ng/g wet weight for tFAC)**

COMPOUND	tDDT	TDieldrin	tC dane	Hexachl	Lindane	Mirex	tPCB	tFAC
1984								
1985								
1986								
1987								
1988								
1989								
1990	627.67	53.10	340.10	10.67	1.73	8.67	4954.33	40721.63
1991	119.00	6.00	31.50	6.00	1.00	2.50	827.00	55039.90
1992								
AVERAGE	373.33	29.55	185.80	8.33	1.37	5.58	2890.67	47880.76
STDEV	359.68	33.30	218.21	3.30	0.52	4.36	2918.47	10124.55

General Location Johns Bay
Specific Site Name Pemaquid Neck
NS&T Site Code JONPN
Nominal Site Center 43° 50.5' N
69° 31.2' W

Species *Scophthalmus aquosus*
[windowpane flounder]



FISH DATA - Organics (ng/g dry weight; ng/g wet weight for tFAC)

COMPOUND	tDDT	TDieldrin	tC dane	Hexachl	Lindane	Mirex	tPCB	tFAC
1984								
1985								
1986								
1987								
1988								
1989								
1990								
1991								48378.20
1992								
AVERAGE								48378.20
STDEV								



General Location

Specific Site Name

NS&T Site Code

Johns Bay
Pemaquid Neck
JONPN



Description

The site is located west of Pemaquid Neck and north of the Pemaquid Ledge marker at the mouth of Johns Bay; 0.6 nautical miles northwest of the R "2" GONG buoy; and 0.2 nautical miles from the shore.

Sediment Locations

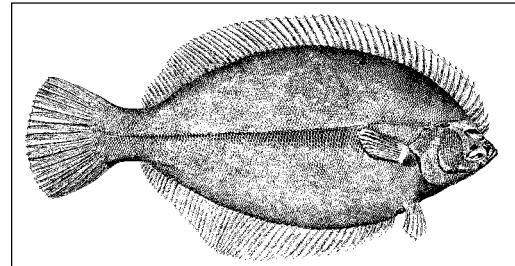
<u>Sample Year</u>	<u>Station</u>	<u>Latitude (N)</u>	<u>Longitude (W)</u>
1990	A	43° 50.2'	69° 31.4'
1990	B	43° 50.6'	69° 31.2'
1990	C	43° 50.7'	69° 31.3'
1991	A	43° 50.8'	69° 31.2'
1991	B	43° 50.3'	69° 31.2'
1991	C	43° 50.0'	69° 31.2'

SEDIMENT DATA - Organics (ng/g dry weight)

COMPOUND	tDDT	TDieldrin	tC dane	Hexachl	Lindane	Mirex	tPCB	tPAH
1984								
1985								
1986								
1987								
1988								
1989								
1990	0.10	0.45	0.05	0.00	0.00	0.00	10.50	193.75
1991	0.07	0.00	0.00	0.00	0.00	0.00	5.43	30.67
1992								
AVERAGE	0.08	0.18	0.02	0.00	0.00	0.00	7.46	95.90
STDEV	0.10	0.36	0.04	0.00	0.00	0.00	4.06	146.60



General Location Casco Bay
Specific Site Name Great Chebeague Island
NS&T Site Code CASGC
Nominal Site Center 44° 15.0' N
 68° 50.0' W
Species *Pleuronectes americanus*
 [winter flounder]

FISH DATA - Metals ($\mu\text{g/g}$ dry weight)

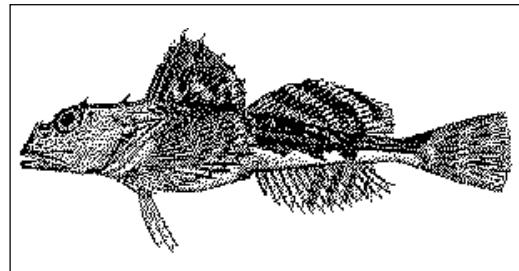
ELEMENTS	Ag	As	Cd	Cr	Cu	Hg	Ni	Pb	Se	Sn	Zn
1984	1.59	7.53	1.14	0.34	68.98	0.37	1.75	8.22	7.72	2.05	184.10
1985											
1986											
1987											
1988											
1989											
1990											
1991											
1992											
AVERAGE	1.59	7.53	1.14	0.34	68.98	0.37	1.75	8.22	7.72	2.05	184.10
STDEV											

FISH DATA - Organics (ng/g dry weight; ng/g wet weight for tFAC)

COMPOUND	tDDT	TDieldrin	tC dane	Hexachl	Lindane	Mirex	tPCB	tFAC
1984	46.46	13.93	40.04	16.60	1.33	0.44	1018.76	51463.79
1985								
1986								
1987								
1988								
1989								
1990								
1991								
1992								
AVERAGE	46.46	13.93	40.04	16.60	1.33	0.44	1018.76	51463.79
STDEV								

General Location Casco Bay
Specific Site Name Great Chebeague Island
NS&T Site Code CASGC
Nominal Site Center 44° 15.0' N
68° 50.0' W

Species *Myoxocephalus octodecemspinosus*
[longhorn sculpin]



FISH DATA - Metals ($\mu\text{g/g}$ dry weight)

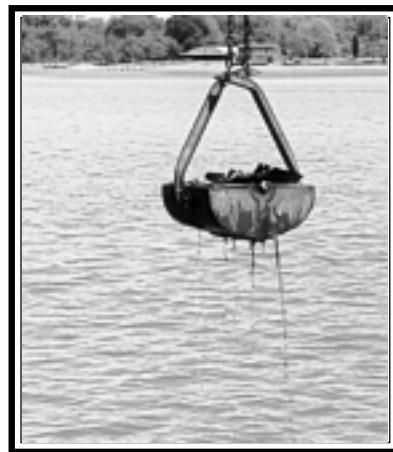
ELEMENTS	Ag	As	Cd	Cr	Cu	Hg	Ni	Pb	Se	Sn	Zn
1984											
1985	0.34	7.14	0.71	1.66	6.60	0.12	0.22	0.33	4.65	0.06	106.09
1986	0.14	2.38	0.72	0.08	4.53	0.17	0.09	0.09	2.49	0.04	87.27
1987											
1988											
1989											
1990											
1991											
1992											
AVERAGE	0.24	4.76	0.72	0.87	5.56	0.15	0.15	0.21	3.57	0.05	96.68
STDEV	0.14	3.36	0.01	1.12	1.46	0.03	0.09	0.17	1.53	0.01	13.31

FISH DATA - Organics (ng/g dry weight; ng/g wet weight for tFAC)

COMPOUND	tDDT	TDieldrin	tC dane	Hexachl	Lindane	Mirex	tPCB	tFAC
1984								
1985	426.00	22.33	70.33	1.00	5.00	6.33	1191.67	15624.42
1986	291.01	21.77	59.47	5.82	9.38	5.01	1044.68	8270.71
1987								
1988								
1989								
1990								
1991								
1992								
AVERAGE	358.51	22.05	64.90	3.41	7.19	5.67	1118.17	11947.56
STDEV	95.45	0.40	7.68	3.41	3.09	0.94	103.94	5199.86



General Location Casco Bay
Specific Site Name Great Chebeague Island
NS&T Site Code CASGC



Description

The site is located 0.4 nautical miles west of Whaleboat Ledge and 0.8 nautical miles east of Great Chebeague Island; CB14 and CB15 are to the east of the other sites. CB14 is 3.8 nautical miles south of Fl 4 sec 25ft 6m buoy and 3.2 nautical miles southwest of F 180ft 18m HORN on Sequin Island. CB15 is 0.6 nautical miles northwest of the RB N buoy and 3.5 nautical miles southwest of Ragged Island.

Sediment Locations

<u>Sample Year</u>	<u>Station</u>	<u>Latitude (N)</u>	<u>Longitude (W)</u>
1984	CB14	43° 38.0'	69° 49.3'
1984	CB15	43° 41.0'	69° 56.7'
1984	CB5	43° 39.6'	70° 09.1'
1985	CB1	43° 47.1'	70° 03.4'
1985	CB2	43° 43.9'	70° 09.0'
1985	CB3	43° 42.8'	70° 05.9'
1985	CB4	43° 40.6'	70° 12.8'
1985	CB5	43° 39.6'	70° 09.1'
1986	CB1	43° 47.1'	70° 03.4'
1986	CB2	43° 43.9'	70° 09.0'
1986	CB4	43° 40.6'	70° 12.8'

SEDIMENT DATA - Metals (µg/g dry weight)

ELEMENTS	Ag	As	Cd	Cr	Cu	Hg	Ni	Pb	Se	Sn	Zn
1984	0.09	8.86	0.15	92.1	16.97	0.12	23.23	29.13	0.17	3.09	76.27
1985	0.21	13.14	0.33	93.03	24.37	0.16	31.3	34.17	0.62	5.78	110
1986	0.28	13.73	0.5	91.47	26.53	0.26	35.7	48.23		5.29	121.33
1987											
1988											
1989											
1990											
1991											
1992											
AVERAGE	0.19	11.91	0.33	92.20	22.62	0.18	30.08	37.18	0.39	4.72	102.53
STDEV	0.10	2.66	0.18	0.79	5.02	0.07	6.32	9.90	0.31	1.43	23.44

SEDIMENT DATA - Organics (ng/g dry weight)

COMPOUND	tDDT	TDieldrin	tC dane	Hexachl	Lindane	Mirex	tPCB	tPAH
1984	0.00	3.20	4.10	1.52	0.00	0.00	95.28	7315.24
1985	3.18	0.00	0.56	1.16	0.00	0.00	74.00	896.29
1986	16.42	7.92	6.17	0.48	0.00	0.00	125.57	1205.04
1987								
1988								
1989								
1990								
1991								
1992								
AVERAGE	6.53	3.71	3.61	1.05	0.00	0.00	98.28	3138.86
STDEV	8.71	3.98	2.84	0.53	0.00	0.00	25.92	3620.15

**General Location**

Casco Bay

Specific Site Name

Cousins Island

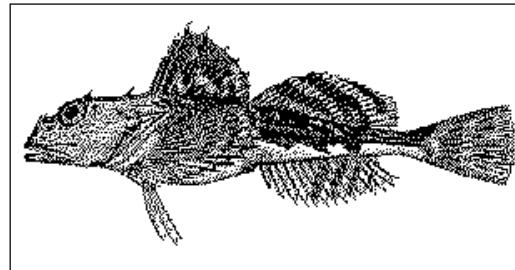
NS&T Site Code

CASCI

Nominal Site Center

43° 41.4' N

70° 08.0' W

SpeciesMyoxocephalus octodecemspinosis
[longhorn sculpin]**FISH DATA - Metals (µg/g dry weight)**

ELEMENTS	Ag	As	Cd	Cr	Cu	Hg	Ni	Pb	Se	Sn	Zn
1984											
1985											
1986											
1987	0.45	2.35	0.52	0.47	2.50		0.09	0.29	4.14	0.07	78.10
1988											
1989											
1990											
1991											
1992											
AVERAGE	0.45	2.35	0.52	0.47	2.50		0.09	0.29	4.14	0.07	78.10
STDEV											

FISH DATA - Organics (ng/g dry weight; ng/g wet weight for tFAC)

COMPOUND	tDDT	TDieldrin	tCdane	Hexachl	Lindane	Mirex	tPCB	tFAC
1984								
1985								
1986								
1987	316.00	15.67	74.33	10.67	0.00	18.67	1772.67	
1988								
1989								
1990								
1991								
1992								
AVERAGE	316.00	15.67	74.33	10.67	0.00	18.67	1772.67	
STDEV								

Description

The site is located in Luckse Sound, east of Long Island, west of Cliff Island, and south of Hope Island; 0.9 nautical miles south southwest of the Fl G 6 sec 24ft "5" marker at Spruce Point on Cousins Island; also 0.7 nautical miles east southeast of Basket Island and 0.3 nautical miles east of the "Bn Ra Ref" marker at the Lower Basket Lodge.

Sediment Locations

Sample Year	Station	Latitude (N)	Longitude (W)
1987	A	43° 47.1'	70° 03.3'
1987	B	43° 43.9'	70° 09.1'
1987	C	43° 40.7'	70° 12.8'
1989	A	43° 41.9'	70° 07.6'
1989	B	43° 41.4'	70° 08.0'
1989	C	43° 41.2'	70° 08.4'

SEDIMENT DATA - Metals (µg/g dry weight)

ELEMENTS	Ag	As	Cd	Cr	Cu	Hg	Ni	Pb	Se	Sn	Zn
1984											
1985											
1986											
1987	0.39	10.6	0.23	319.37	20.17	0.08	22.77	41.23	1	5.46	114.33
1988											
1989	0.12	9.81	0.18	48.51	9.42	0.1	18.63	37.3	0.26	2.56	52.02
1990											
1991											
1992											
AVERAGE	0.25	10.20	0.20	183.94	14.79	0.09	20.70	39.26	0.63	4.01	83.17
STDEV	0.19	0.56	0.03	191.52	7.60	0.01	2.92	2.78	0.52	2.06	44.06

SEDIMENT DATA - Organics (ng/g dry weight)

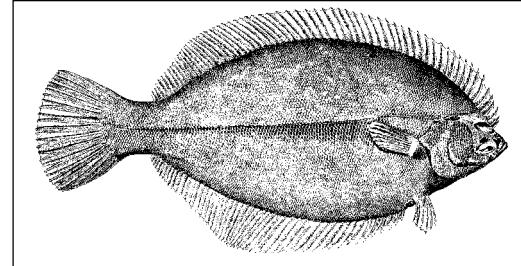
COMPOUND	tDDT	TDieldrin	tC dane	Hexachl	Lindane	Mirex	tPCB	tPAH
1984								
1985								
1986								
1987	6.60	0.23	1.63	1.43	0.25	1.00	161.75	3097.25
1988								
1989								
1990								
1991								
1992								
AVERAGE	6.60	0.23	1.63	1.43	0.25	1.00	161.75	3097.25
STDEV								



General Location
MAINE
Specific Site Name
Cape Elizabeth
NS&T Site Code
Richmond Island
Nominal Site Center

Cape Elizabeth
Richmond Island
CAPRI
43° 31.9' N
70° 16.6' W

Species *Pleuronectes americanus*
[winter flounder]



FISH DATA - Metals ($\mu\text{g/g}$ dry weight)

ELEMENTS	Ag	As	Cd	Cr	Cu	Hg	Ni	Pb	Se	Sn	Zn
1984											
1985											
1986											
1987											
1988											
1989											
1990											
1991											
1992	1.26	13.93	0.42		58.97	0.14		3.65	9.93	0.58	122.70
AVERAGE	1.26	13.93	0.42		58.97	0.14		3.65	9.93	0.58	122.70
STDEV											

General Location

Cape Elizabeth

Specific Site Name

Richmond Island

NS&T Site Code

CAPRI

Nominal Site Center

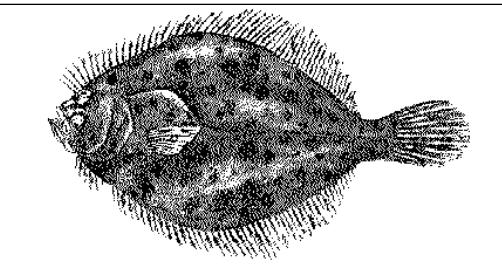
43° 31.9' N

70° 16.6' W

Species

Scophthalmus aquosus

[windowpane flounder]

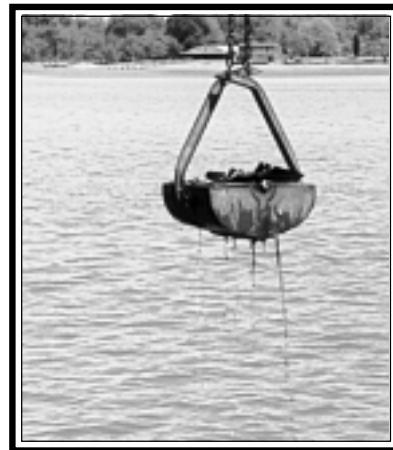


FISH DATA - Organics (ng/g dry weight; ng/g wet weight for tFAC)

COMPOUND	tDDT	TDieldrin	tC dane	Hexachl	Lindane	Mirex	tPCB	tFAC
1984								
1985								
1986								
1987								
1988								
1989								
1990								
1991								62859.00
1992								
AVERAGE								62859.00
STDEV								

General Location
Specific Site Name
NS&T Site Code

Cape Elizabeth
 Richmond Island
 CAPRI



Description

The site is located southeast of Old Proprieter ledge; 0.5 nautical miles southeast of buoy GC "1", 1.5 nautical miles west southwest of Richmond Island; and 1.3 nautical miles southwest of C "3" G in Richmond Island Harbor.

Sediment Locations

<u>Sample Year</u>	<u>Station</u>	<u>Latitude (N)</u>	<u>Longitude (W)</u>
1990	A	43° 32.3'	70° 15.9'
1990	B	43° 31.9'	70° 16.6'
1990	C	43° 31.6'	70° 17.3'
1991	A	43° 32.4'	70° 15.5'
1991	B	43° 31.5'	70° 17.2'
1991	C	43° 30.9'	70° 18.4'

SEDIMENT DATA - Organics (ng/g dry weight)

COMPOUND	tDDT	TDieldrin	tC dane	Hexachl	Lindane	Mirex	tPCB	tPAH
1984								
1985								
1986								
1987								
1988								
1989								
1990	0.33	0.30	0.13	0.13	0.13	0.00	15.43	173.67
1991	0.30	0.00	0.00	0.00	0.00	0.00	12.33	340.67
1992								
AVERAGE	0.32	0.15	0.07	0.07	0.07	0.00	13.88	257.17
STDEV	0.35	0.29	0.15	0.15	0.15	0.00	12.44	176.62

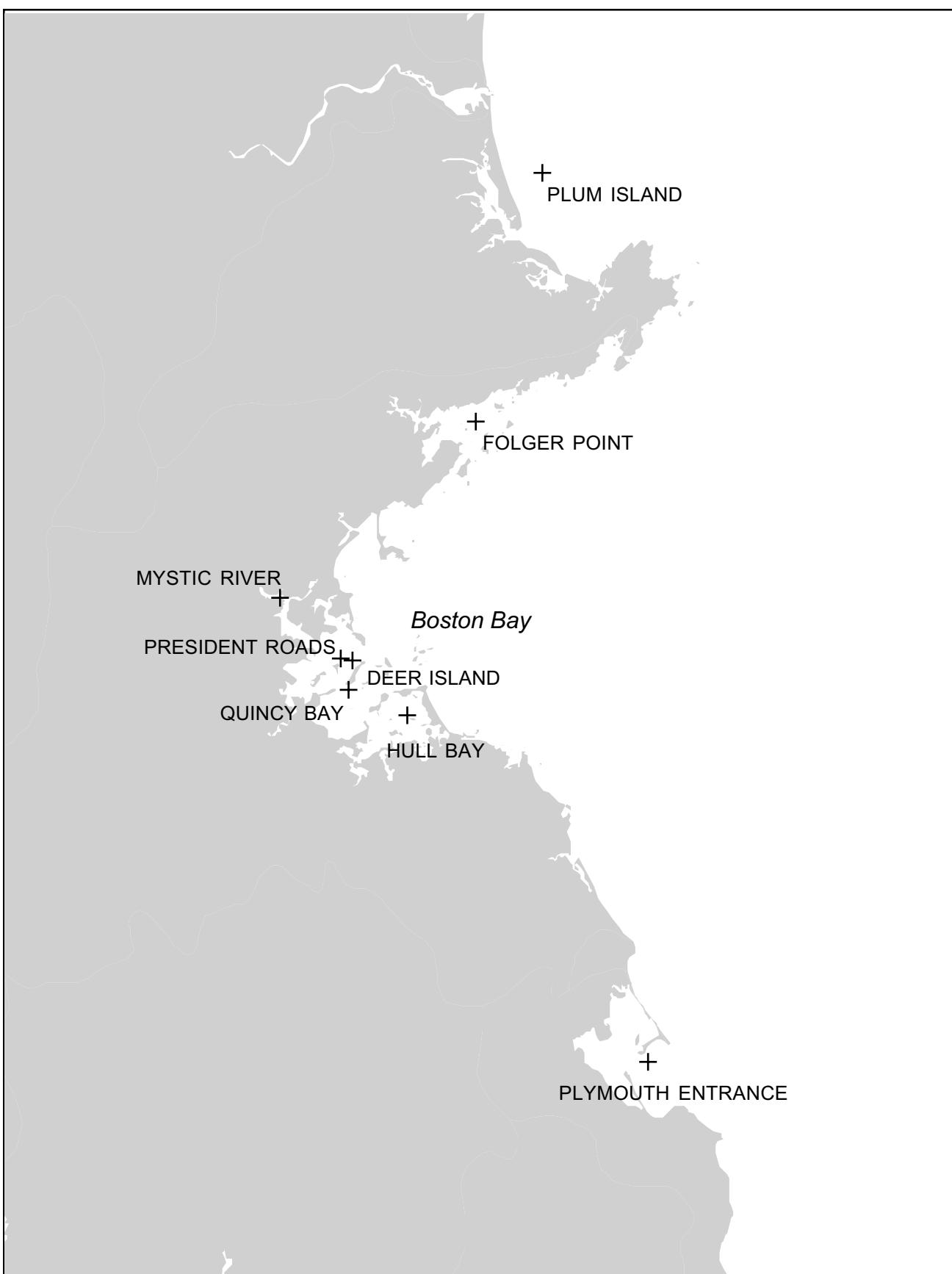


Figure 5. *Plum Island to Plymouth Entrance.*

Table 2b - North Atlantic Estuaries

NS&T BSP Fish and Sediment Site Sampling Years

General Site Name	Site Code	Specific Site Name	Species	Fish	Sediment
Massachusetts					
Merrimac River	MERPI	Plum Island	wf	84 85	84 85
Salem Harbor	SALFP	Folger Point	wf	84 85 86 88 91	
Salem Harbor	SALFP	Folger Point	wpf		91
Salem Harbor	SALFP	Folger Point			84 85 86 88 89 91
Boston Harbor	BOSPR	President Roads	wf	84 85 86	84 85 86
Boston Harbor	BOSDI	Deer Island	wf	87 88 89 90 91	
Boston Harbor	BOSDI	Deer Island	wpf		91
Boston Harbor	BOSDI	Deer Island			87 88 89
Boston Harbor	BOSQB	Quincy Bay	wf	86 89 90 91	86 89
Boston Harbor	BOSHB	Hull Bay	wf	89 90	89
Boston Harbor	BOSMR	Mystic River	wf	89 90 91	
Boston Harbor	BOSMR	Mystic River	wpf	91	
Boston Harbor	BOSMR	Mystic River			89
Massachusetts Bay	MASPE	Plymouth Entrance	wf	89	89

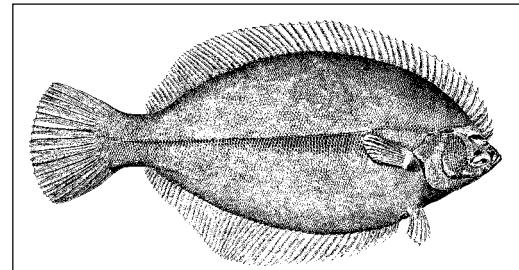
North Atlantic Estuaries

MASSACHUSETTS

General Location
Specific Site Name
NS&T Site Code
Nominal Site Center

Merrimac River
Plum Island
MERPI
42° 45.0' N
70° 45.0' W

Species *Pleuronectes americanus*
[winter flounder]



FISH DATA - Metals ($\mu\text{g/g}$ dry weight)

ELEMENTS	Ag	As	Cd	Cr	Cu	Hg	Ni	Pb	Se	Sn	Zn
1984	1.39	10.11	0.69	0.09	56.02	0.26	0.71	0.57	6.74	1.02	161.33
1985	1.60	19.70	0.69	0.19	41.59	0.25	0.42	2.08	7.33	0.22	147.10
1986											
1987											
1988											
1989											
1990											
1991											
1992											
AVERAGE	1.50	14.91	0.69	0.14	48.80	0.26	0.56	1.32	7.04	0.62	154.22
STDEV	0.15	6.78	0.00	0.07	10.21	0.01	0.21	1.07	0.42	0.56	10.06

FISH DATA - Organics (ng/g dry weight; ng/g wet weight for tFAC)

COMPOUND	tDDT	TDieldrin	tC dane	Hexachl	Lindane	Mirex	tPCB	tFAC
1984	77.89	14.14	62.37	7.59	2.94	1.80	1371.21	73508.86
1985	501.67	28.67	155.67	1.67	4.67	5.33	3821.00	55083.54
1986								
1987								
1988								
1989								
1990								
1991								
1992								
AVERAGE	289.78	21.40	109.02	4.63	3.80	3.57	2596.11	64296.20
STDEV	299.66	10.27	65.97	4.19	1.22	2.50	1732.26	13028.67

Description

The site is located 1.8 nautical miles east northeast of the cupola (domed roof structure) on Plum Island; 3.4 nautical miles north of the R "2" FI R 4s BELL buoy east of Castle Neck and 4.0 nautical miles south of the RW "MR" Mo(A) WHISTLE buoy at the mouth of the Merrimac River.

Sediment Locations

<u>Sample Year</u>	<u>Station</u>	<u>Latitude (N)</u>	<u>Longitude (W)</u>
1984	MR2	42° 48.5'	70° 47.5'
1984	MR3	42° 43.3'	70° 44.0'
1985	MR1	42° 50.9'	70° 47.7'
1985	MR2	42° 48.5'	70° 47.5'
1985	MR3	42° 43.3'	70° 44.0'

SEDIMENT DATA - Metals (µg/g dry weight)

ELEMENTS	Ag	As	Cd	Cr	Cu	Hg	Ni	Pb	Se	Sn	Zn
1984	0.05	4.62	0.11	41.15	6.47	0.06	6.54	23.25	0.04	5.99	35.75
1985	0.01	3.89		14.25	3.57		3.49	19.67		1.88	21.3
1986											
1987											
1988											
1989											
1990											
1991											
1992											
AVERAGE	0.03	4.25	0.11	27.70	5.02	0.06	5.02	21.46	0.04	3.94	28.53
STDEV	0.03	0.52		19.02	2.05		2.16	2.53		2.91	10.22

SEDIMENT DATA - Organics (ng/g dry weight)

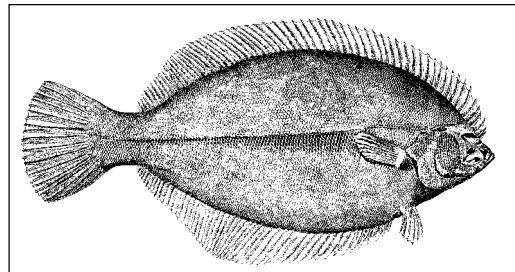
COMPOUND	tDDT	TDieldrin	tC dane	Hexachl	Lindane	Mirex	tPCB	tPAH
1984	0.00	0.00	1.74	0.97	0.23	0.00	52.97	1727.31
1985	0.00	0.33	0.03	0.43	0.20	0.00	13.40	128.66
1986								
1987								
1988								
1989								
1990								
1991								
1992								
AVERAGE	0.00	0.17	0.89	0.70	0.21	0.00	33.19	927.98
STDEV	0.00	0.24	1.21	0.38	0.02	0.00	27.98	1130.42



General Location
Specific Site Name
NS&T Site Code
Nominal Site Center

Salem Harbor
Folger Point
SALFP
42° 32.2' N
70° 49.6' W

Species *Pleuronectes americanus*
[winter flounder]



FISH DATA - Metals ($\mu\text{g/g}$ dry weight)

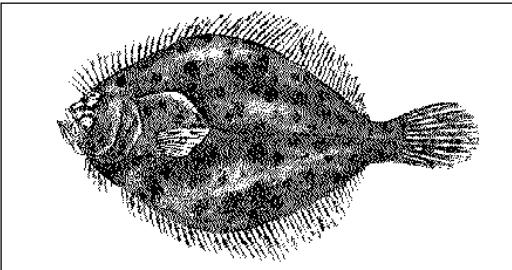
ELEMENTS	Ag	As	Cd	Cr	Cu	Hg	Ni	Pb	Se	Sn	Zn
1984	0.51	1.64	0.08	0.75	10.40	0.09	0.38	0.53	2.80	0.31	81.79
1985	1.30	9.07	0.36	0.27	33.10	0.21	0.61	1.76	5.26	0.46	123.30
1986	0.77	7.38	0.46	0.17	22.09	0.26	0.58	2.15	7.61	0.17	132.46
1987											
1988	1.63	11.39	0.60	0.24	36.10	0.28	0.37	3.03	5.09	0.43	108.20
1989											
1990											
1991											
1992											
AVERAGE	1.05	7.37	0.38	0.35	25.42	0.21	0.48	1.87	5.19	0.34	111.44
STDEV	0.50	4.16	0.22	0.27	11.69	0.08	0.13	1.04	1.96	0.14	22.15

FISH DATA - Organics (ng/g dry weight; ng/g wet weight for tFAC)

COMPOUND	tDDT	TDieldrin	tC dane	Hexachl	Lindane	Mirex	tPCB	tFAC
1984	583.92	276.90	322.76	15.60	0.00	5.45	835.77	74430.37
1985	328.33	13.00	157.33	7.00	2.00	4.00	2212.67	157065.58
1986	466.42	65.23	148.91	3.52	2.35	3.67	2617.41	32991.83
1987								
1988	1140.50	35.00	357.00	14.50	2.00	9.00	6305.50	10991.13
1989								77673.94
1990								
1991	502.50	14.00	199.00	9.50	1.50	18.50	5057.50	41868.18
1992								
AVERAGE	604.34	80.83	237.00	10.02	1.57	8.12	3405.77	65836.84
STDEV	313.63	111.64	96.57	5.07	0.93	6.17	2224.10	51377.02

General Location Salem Harbor
Specific Site Name Folger Point
NS&T Site Code SALFP
Nominal Site Center 42° 32.2' N
70° 49.6' W

Species *Scophthalmus aquosus*
[windowpane flounder]



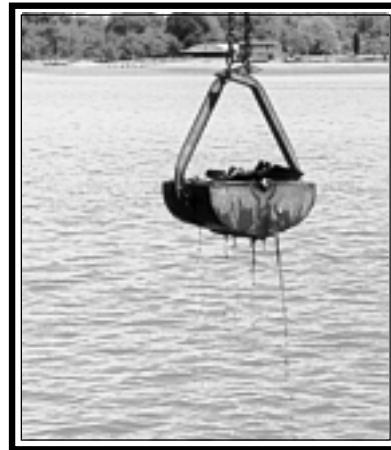
FISH DATA - Organics (ng/g dry weight; ng/g wet weight for tFAC)

COMPOUND	tDDT	TDieldrin	tC dane	Hexachl	Lindane	Mirex	tPCB	tFAC
1984								
1985								
1986								
1987								
1988								
1989								
1990								
1991								58034.63
1992								
AVERAGE								58034.63
STDEV								



General Location
Specific Site Name
NS&T Site Code

Salem Harbor
 Folger Point
 SALFP



Description

The site is located in the middle of Salem Sound, east of Marblehead and west of Great Misery Island; 0.5 nautical miles north of N "6" marking Cut Throat Shoal; 0.4 nautical miles northwest of N "8"; and 0.6 nautical miles southeast of Haste Shoal.

Sediment Locations

<u>Sample Year</u>	<u>Station</u>	<u>Latitude (N)</u>	<u>Longitude (W)</u>
1984	SH1	42° 31.0'	70° 52.4'
1984	SH2	42° 31.5'	70° 51.6'
1984	SH3	42° 32.3'	70° 51.0'
1985	SH1	42° 31.0'	70° 52.4'
1985	SH2	42° 31.5'	70° 51.6'
1985	SH3	42° 32.3'	70° 51.0'
1985	SH4	42° 31.3'	70° 52.0'
1986	SH1	42° 31.0'	70° 52.4'
1986	SH2	42° 31.5'	70° 51.6'
1986	SH3	42° 32.3'	70° 51.0'
1988	A	42° 31.5'	70° 51.6'
1988	B	42° 32.3'	70° 51.0'
1988	C	42° 31.3'	70° 52.0'
1989	A	42° 32.2'	70° 49.9'
1989	B	42° 32.2'	70° 49.6'
1989	C	42° 32.1'	70° 49.2'
1990	A	42° 31.0'	70° 52.4'
1990	B	42° 31.5'	70° 51.6'
1990	C	42° 32.3'	70° 51.0'
1991	A	42° 32.5'	70° 50.1'
1991	B	42° 32.1'	70° 49.8'
1991	C	42° 31.7'	70° 49.4'

SEDIMENT DATA - Metals (µg/g dry weight)

ELEMENTS	Ag	As	Cd	Cr	Cu	Hg	Ni	Pb	Se	Sn	Zn
1984	1.83	15.9	5.87	2296.7	95.07	1.19	30.37	186.33	1.22	9.95	238
1985	1.6	12.75	6.23	1877	79.33	1.01	32.63	141.73	0.72	14.18	204
1986	0.88	12.17	4.48	1112	60.47	0.78	27.1	94.9	0.41	12.21	154
1987											
1988	1.6	10.59	3.24	1356.7	46.55	0.97	20.58	110.18	0.8	10.53	197.74
1989	1.54	18.06	4.52	1716.7	55.05	0.95	26.37	398.45	0.51	74.83	200.61
1990											
1991											
1992											
AVERAGE	1.49	13.89	4.87	1671.81	67.29	0.98	27.41	186.32	0.73	24.34	198.87
STDEV	0.36	3.02	1.20	460.23	19.64	0.15	4.58	123.63	0.32	28.28	29.90

SEDIMENT DATA - Organics (ng/g dry weight)

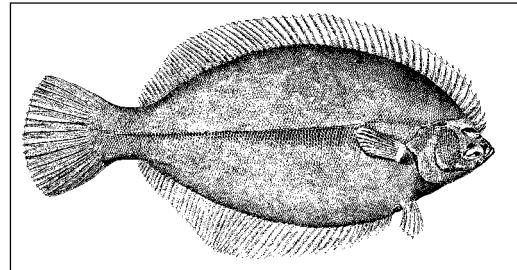
COMPOUND	tDDT	TDieldrin	tC dane	Hexachl	Lindane	Mirex	tPCB	tPAH
1984	51.48	0.00	15.71	4.60	6.29	0.00	651.45	11615.91
1985	19.00	5.75	4.50	1.25	2.23	0.00	305.25	14781.62
1986	35.12	0.18	3.30	0.95	1.20	1.85	188.75	5475.54
1987								
1988	17.00	1.00	6.18	1.96	1.00	0.00	249.60	5084.00
1989								
1990								
1991	6.70	0.30	1.43	0.13	0.00	0.00	111.67	3332.33
1992								
AVERAGE	24.49	1.64	6.12	1.77	2.02	0.31	295.81	8100.99
STDEV	18.71	2.67	5.54	1.73	3.43	0.74	201.46	6541.15



General Location
Specific Site Name
NS&T Site Code
Nominal Site Center

Boston Harbor
President Roads
BOSPR
42° 20.0' N
70° 59.0' W

Species *Pleuronectes americanus*
[winter flounder]



FISH DATA - Metals ($\mu\text{g/g}$ dry weight)

ELEMENTS	Ag	As	Cd	Cr	Cu	Hg	Ni	Pb	Se	Sn	Zn
1984	0.70	2.00	0.15	0.38	15.10	0.12	0.29	0.63	3.02	0.28	86.08
1985	1.38	12.73	0.80	0.55	24.69	0.83	0.54	2.05	6.40	0.62	100.48
1986	1.44	4.19	0.49	0.19	34.41	0.66	0.45	1.78	6.08	0.89	98.51
1987											
1988											
1989											
1990											
1991											
1992											
AVERAGE	1.18	6.30	0.48	0.37	24.73	0.53	0.42	1.49	5.16	0.60	95.02
STDEV	0.41	5.67	0.33	0.18	9.65	0.37	0.12	0.75	1.86	0.31	7.81

FISH DATA - Organics (ng/g dry weight; ng/g wet weight for tFAC)

COMPOUND	tDDT	TDieldrin	tC dane	Hexachl	Lindane	Mirex	tPCB	tFAC
1984	827.23	141.31	910.74	12.90	1.30	11.31	10486.91	209530.71
1985	625.00	82.00	512.00	3.00	2.00	10.67	5452.33	105980.45
1986	879.62	248.11	688.04	14.09	0.00	10.22	9240.70	35850.26
1987								
1988								
1989								
1990								
1991								
1992								
AVERAGE	777.28	157.14	703.59	10.00	1.10	10.73	8393.32	117120.47
STDEV	134.46	84.18	199.82	6.09	1.01	0.55	2622.08	87374.48

Description

The site is located southeast of Old Proprieter ledge; 0.5 nautical miles southeast of buoy GC "1"; 1.5 nautical miles west southwest of Richmond Island; and 1.3 nautical miles southwest of C "3" G in Richmond Island Harbor.

Sediment Locations

Sample Year	Station	Latitude (N)	Longitude (W)
1984	BH1	42° 20.9'	70° 58.0'
1984	BH2	42° 19.8'	70° 58.2'
1984	BH3	42° 19.7'	71° 00.1'
1985	BH2	42° 19.8'	70° 58.2'
1985	BH3	42° 19.7'	71° 00.1'
1985	BH4	42° 20.7'	70° 58.9'
1985	BH5	42° 20.5'	71° 00.2'
1986	BH1	42° 20.9'	70° 58.0'
1986	BH2	42° 19.8'	70° 58.2'
1986	BH3	42° 19.7'	71° 00.1'

SEDIMENT DATA - Metals (µg/g dry weight)

ELEMENTS	Ag	As	Cd	Cr	Cu	Hg	Ni	Pb	Se	Sn	Zn
1984	6.2	11.19	1.61	223.67	148	1.05	29.77	123.97	0.8	26.4	291.67
1985	7.91	9.94	2.32	293	164	1.04	36.08	129.25	0.79	25.9	246.5
1986	4.24	9.57	1.66	179.4	119.43	0.92	25	77.53	0.34	22.29	178.4
1987											
1988											
1989											
1990											
1991											
1992											
AVERAGE	6.12	10.23	1.86	232.02	143.81	1.00	30.28	110.25	0.64	24.86	238.86
STDEV	1.84	0.85	0.39	57.26	22.58	0.07	5.56	28.46	0.26	2.24	57.02

SEDIMENT DATA - Organics (ng/g dry weight)

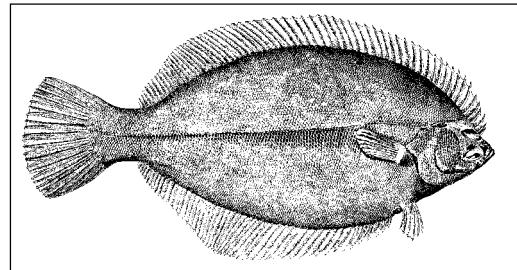
COMPOUND	tDDT	TDieldrin	tC dane	Hexachl	Lindane	Mirex	tPCB	tPAH
1984	209.63	1.41	8.12	1.61	0.14	0.81	17104.86	26437.38
1985	17.50	2.50	7.00	0.80	0.00	0.35	348.00	11514.66
1986	33.91	0.08	6.31	0.95	1.42	2.14	432.40	10255.67
1987								
1988								
1989								
1990								
1991								
1992								
AVERAGE	87.01	1.33	7.14	1.12	0.52	1.10	5961.75	16069.24
STDEV	106.51	1.21	0.91	0.43	0.78	0.93	9650.31	9001.12



General Location
Boston Harbor
Specific Site Name
Deer Island
NS&T Site Code
BOSDI
Nominal Site Center

Boston Harbor
Deer Island
BOSDI
42°19.9' N
70°58.1' W

Species *Pleuronectes americanus*
[winter flounder]



FISH DATA - Metals ($\mu\text{g/g}$ dry weight)

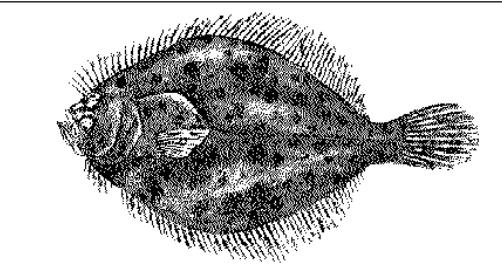
ELEMENTS	Ag	As	Cd	Cr	Cu	Hg	Ni	Pb	Se	Sn	Zn
1984											
1985											
1986											
1987	1.71	3.63	0.33	0.73	23.82	0.35	0.65	0.92	3.73	0.02	108.70
1988	2.02	9.11	0.43	0.09	27.20	0.52	0.25	1.11	4.30	0.60	99.18
1989											
1990											
1991											
1992											
AVERAGE	1.86	6.37	0.38	0.41	25.51	0.43	0.45	1.02	4.02	0.31	103.94
STDEV	0.22	3.87	0.07	0.45	2.39	0.12	0.28	0.14	0.40	0.41	6.73

FISH DATA - Organics (ng/g dry weight; ng/g wet weight for tFAC)

COMPOUND	tDDT	TDieldrin	tC dane	Hexachl	Lindane	Mirex	tPCB	tFAC
1984								
1985								
1986								
1987	805.00	113.33	659.00	21.33	4.00	30.33	15073.00	
1988	680.00	90.00	614.33	20.33	2.67	14.00	10362.67	32657.94
1989	323.50	24.25	258.25	8.25	1.00	7.25	6654.00	95080.92
1990	654.67	69.67	548.33	17.00	2.67	12.00	10210.67	84201.78
1991	240.50	21.75	72.00	5.50	2.25	7.00	2591.50	115354.54
1992								
AVERAGE	540.73	63.80	430.38	14.48	2.52	14.12	8978.37	81823.80
STDEV	244.72	40.33	254.01	7.19	1.07	9.56	4657.63	35227.82

General Location Boston Harbor
Specific Site Name Deer Island
NS&T Site Code BOSDI
Nominal Site Center 42° 19.9' N
70° 58.1' W

Species *Scophthalmus aquosus*
[windowpane flounder]



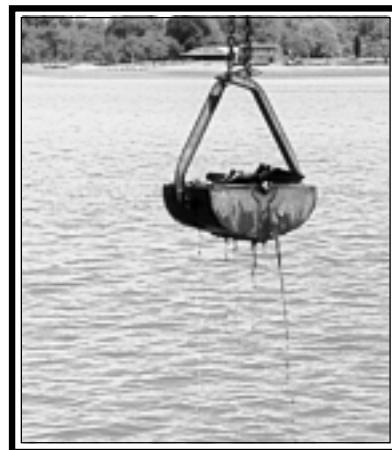
FISH DATA - Organics (ng/g dry weight; ng/g wet weight for tFAC)

COMPOUND	tDDT	TDieldrin	tC dane	Hexachl	Lindane	Mirex	tPCB	tFAC
1984								
1985								
1986								
1987								
1988								
1989								
1990								
1991								332478.55
1992								
AVERAGE								332478.55
STDEV								



General Location
Specific Site Name
NS&T Site Code

Boston Harbor
Deer Island
BOSDI



Description

The site is located in the President Roads ship channel, north of Sculpin Ledge Channel and south of Deer Island Flats; 0.8 nautical miles southeast of W "C" Fl 4 sec marker which is on the southeast edge of Governors Island Flats; 0.8 nautical miles southwest of the Deer Island marker [Alt Fl W & R 10 sec 53 ft 10M HORN Occ 4 sec]; and 0.4 nautical miles west northwest of the G "13" Fl G 2.5 sec, which is north of Long Island.

Sediment Locations

<u>Sample Year</u>	<u>Station</u>	<u>Latitude (N)</u>	<u>Longitude (W)</u>
1987	A	42° 20.8'	70° 57.9'
1987	B	42° 19.9'	70° 58.1'
1987	C	42° 19.8'	70° 59.9'
1988	A	42° 20.6'	70° 58.0'
1988	B	42° 21.0'	70° 58.2'
1988	C	42° 21.0'	70° 58.6'
1989	A	42° 21.0'	70° 58.4'
1989	B	42° 20.6'	70° 58.2'
1989	C	42° 20.6'	70° 58.0'

SEDIMENT DATA - Metals (µg/g dry weight)

ELEMENTS	Ag	As	Cd	Cr	Cu	Hg	Ni	Pb	Se	Sn	Zn
1984											
1985											
1986											
1987	1.53	9.5	1.41	79.93	90.58	0.9	37.33	118.47	0.18	9.07	185.67
1988	2.79	7.39	1.17	126.49	77.99	0.46	24.58	79.11	0.32	13.47	138.97
1989	4.29	13.46	1.33	158.74	97.4	0.65	27.8	88.96	0.41	11.53	143.9
1990											
1991											
1992											
AVERAGE	2.87	10.12	1.30	121.72	88.66	0.67	29.90	95.51	0.30	11.35	156.18
STDEV	1.39	3.08	0.12	39.62	9.85	0.22	6.63	20.48	0.11	2.21	25.66

SEDIMENT DATA - Organics (ng/g dry weight)

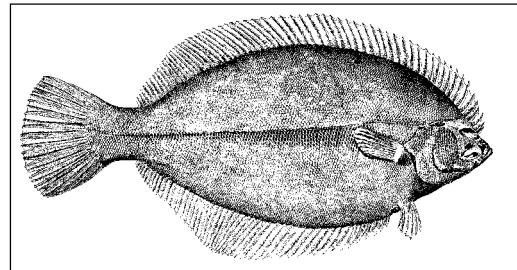
COMPOUND	tDDT	TDieldrin	tCdane	Hexachl	Lindane	Mirex	tPCB	tPAH
1984								
1985								
1986								
1987	17.33	1.75	9.25	2.75	0.25	0.75	7402.25	11880.75
1988	2.17	1.33	6.57	0.60	0.00	0.00	321.33	7335.67
1989	2.13	0.00	5.30	0.33	0.00	0.00	291.67	5585.67
1990								
1991								
1992								
AVERAGE	7.21	1.03	7.04	1.23	0.08	0.25	2671.75	8267.36
STDEV	8.76	0.91	2.02	1.33	0.14	0.43	4096.76	3249.32

MASSACHUSETTS

General Location
Specific Site Name
NS&T Site Code
Nominal Site Center

Boston Harbor
Quincy Bay
BOSQB
42°18.4' N
70°58.4' W

Species *Pleuronectes americanus*
[winter flounder]

**FISH DATA - Metals (µg/g dry weight)**

ELEMENTS	Ag	As	Cd	Cr	Cu	Hg	Ni	Pb	Se	Sn	Zn
1984											
1985											
1986	0.85	13.20	0.55	0.14	14.46	0.78	0.24	1.06	5.86	0.18	95.14
1987											
1988											
1989											
1990											
1991											
1992											
AVERAGE	0.85	13.20	0.55	0.14	14.46	0.78	0.24	1.06	5.86	0.18	95.14
STDEV											

FISH DATA - Organics (ng/g dry weight; ng/g wet weight for tFAC)

COMPOUND	tDDT	TDieldrin	tCdane	Hexachl	Lindane	Mirex	tPCB	tFAC
1984								
1985								
1986	657.65	210.21	518.66	11.00	2.31	7.24	6165.80	65007.98
1987								
1988								
1989	183.33	16.67	135.00	5.67	4.00	6.67	4062.00	466568.43
1990	431.17	49.07	256.17	6.33	1.80	6.90	5576.00	99077.70
1991								104989.80
1992								
AVERAGE	424.05	91.98	303.28	7.67	2.70	6.94	5267.93	183910.98
STDEV	237.24	103.66	196.12	2.90	1.15	0.29	1085.20	189260.31

Description

The site is located 0.1 nautical miles south of R N "8" channel marker, which is south of West Head, southeast of Moon Head, west of Rainsford Island, and north of Sunken Ledge.

Sediment Locations

Sample Year	Station	Latitude (N)	Longitude (W)
1986	QB1	42° 17.5'	70° 59.2'
1986	QB2	42° 17.2'	70° 58.0'
1986	QB3	42° 18.4'	70° 58.4'
1989	A	42° 18.2'	70° 59.1'
1989	B	42° 17.9'	70° 59.2'
1989	C	42° 17.6'	70° 59.5'

SEDIMENT DATA - Metals (µg/g dry weight)

ELEMENTS	Ag	As	Cd	Cr	Cu	Hg	Ni	Pb	Se	Sn	Zn
1984											
1985											
1986	5.6	11.67	0.9	224.33	133.67	1.38	29.9	95.6	0.34	26.67	192
1987											
1988											
1989	5.43	13.02	1.51	202.66	127.18	1.39	30.9	145.53	0.45	17.9	197.38
1990											
1991											
1992											
AVERAGE	5.52	12.34	1.20	213.50	130.42	1.39	30.40	120.56	0.39	22.28	194.69
STDEV	0.12	0.96	0.43	15.33	4.59	0.01	0.71	35.30	0.08	6.20	3.80

SEDIMENT DATA - Organics (ng/g dry weight)

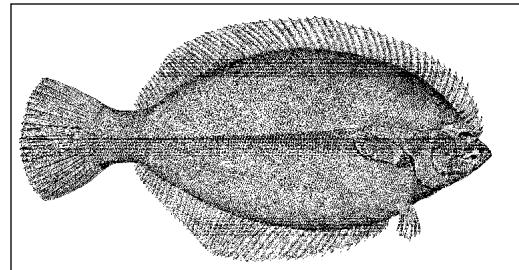
COMPOUND	tDDT	TDieldrin	tC dane	Hexachl	Lindane	Mirex	tPCB	tPAH
1984								
1985								
1986	30.96	0.32	7.72	0.68	0.87	2.80	392.12	5483.69
1987								
1988								
1989	34.33	10.00	15.33	0.67	0.00	0.00	806.67	25598.67
1990								
1991								
1992								
AVERAGE	32.65	5.16	11.53	0.67	0.44	1.40	599.39	15541.18
STDEV	2.39	6.84	5.39	0.01	0.62	1.98	293.13	14223.44



General Location
Specific Site Name
NS&T Site Code
Nominal Site Center

Boston Harbor
Hull Bay
BOSHB
42° 17.1' N
70° 54.4' W

Species *Pleuronectes americanus*
[winter flounder]



FISH DATA - Organics (ng/g dry weight; ng/g wet weight for tFAC)

COMPOUND	tDDT	TDieldrin	tC dane	Hexachl	Lindane	Mirex	tPCB	tFAC
1984								
1985								
1986								
1987								
1988								
1989	401.00	19.33	227.33	6.33	3.67	7.33	5328.00	152999.25
1990	667.33	64.00	422.33	10.00	3.33	12.00	8215.33	100935.10
1991								
1992								
AVERAGE	534.17	41.67	324.83	8.17	3.50	9.67	6771.67	126967.18
STDEV	188.33	31.58	137.89	2.59	0.24	3.30	2041.65	36814.91

Description

The site is located at the western edge of Hull Bay; 0.5 nautical miles northwest of Bumpkin Island; 0.3 nautical miles west of privately maintained buoy C "1A"; and 0.25 nautical miles south-southeast of Fl 4 sec buoy "1".

Sediment Locations

Sample Year	Station	Latitude (N)	Longitude (W)
1989	A	42° 17.9'	70° 53.9'
1989	B	42° 17.6'	70° 54.0'
1989	C	42° 17.3'	70° 54.2'

SEDIMENT DATA - Metals ($\mu\text{g/g}$ dry weight)

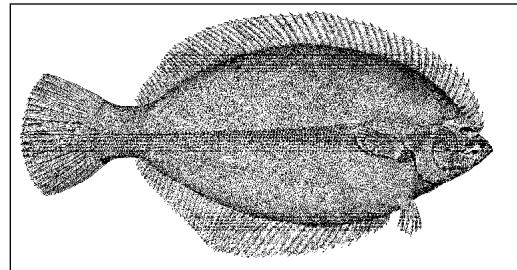
SEDIMENT DATA - Organics (ng/g dry weight)



General Location
Specific Site Name
NS&T Site Code
Nominal Site Center

Boston Harbor
Mystic River
BOSMR
42° 23.2' N
71° 03.2' W

Species *Pleuronectes americanus*
[winter flounder]

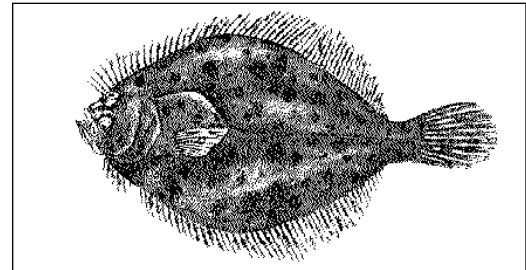


FISH DATA - Organics (ng/g dry weight; ng/g wet weight for tFAC)

COMPOUND	tDDT	TDieldrin	tC dane	Hexachl	Lindane	Mirex	tPCB	tFAC
1984								
1985								
1986								
1987								
1988								
1989	165.50	18.50	132.00	4.50	3.00	1.00	4054.50	741026.32
1990	737.33	78.00	482.00	13.00	2.00	12.67	14748.00	257001.81
1991								278210.11
1992								
AVERAGE	451.42	48.25	307.00	8.75	2.50	6.83	9401.25	425412.75
STDEV	404.35	42.07	247.49	6.01	0.71	8.25	7561.45	273535.00

General Location	Boston Harbor
Specific Site Name	Mystic River
NS&T Site Code	BOSMR
Nominal Site Center	42° 23.2' N 71° 03.2' W

Species *Scophthalmus aquosus*
[windowpane flounder]

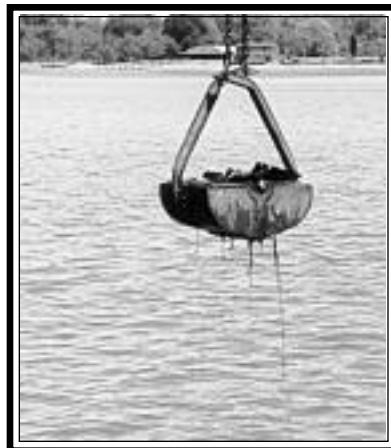


FISH DATA - Organics (ng/g dry weight; ng/g wet weight for tFAC)



General Location
Specific Site Name
NS&T Site Code

Boston Harbor
Mystic River
BOSMR



Description

The site is located near the mouth of the Island End River; 0.01 nautical miles north of the Mystic Wharf and just northeast of the N "2" marker, and 0.25 nautical miles up river from the Mystic River-Tobin Memorial Bridge.

Sediment Locations

Sample Year	Station	Latitude (N)	Longitude (W)
1989	A	42° 23.1'	71° 03.0'
1989	B	42° 23.1'	71° 03.2'
1989	C	42° 23.2'	71° 03.5'

A Summary of Chemical Contaminant Levels at Benthic Surveillance Project Sites (1984 - 1992)

SEDIMENT DATA - Metals (ug/g dry weight)

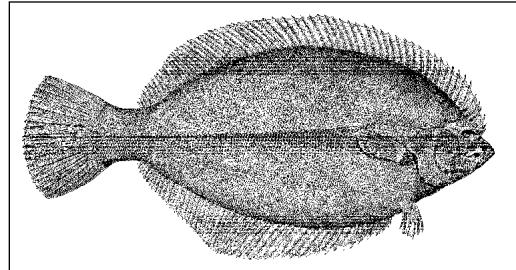
SEDIMENT DATA - Organics (ng/g dry weight)



General Location
Specific Site Name
NS&T Site Code
Nominal Site Center

Massachusetts Bay
Plymouth Entrance
MASPE
41° 59.3' N
70° 37.6' W

Species *Pleuronectes americanus*
 [winter flounder]



FISH DATA - Organics (ng/g dry weight; ng/g wet weight for tFAC)

COMPOUND	tDDT	TDieldrin	tC dane	Hexachl	Lindane	Mirex	tPCB	tFAC
1984								
1985								
1986								
1987								
1988								
1989	140.33	7.67	48.00	5.00	0.00	5.67	1873.67	107854.45
1990								
1991								
1992								
AVERAGE	140.33	7.67	48.00	5.00	0.00	5.67	1873.67	107854.45
STDEV								

Description

The site is located in Plymouth Bay north of Browns Bank; 0.6 nautical miles southeast of Saquish Head; 1.3 nautical miles orth-northeast of G "5A" marker off Plymouth Beach.

Sediment Locations

Sample Year	Station	Latitude (N)	Longitude (W)
1989	A	41° 59.2'	70° 37.9'
1989	B	41° 59.3'	70° 37.6'
1989	C	41° 59.5'	70° 37.2'

SEDIMENT DATA - Metals (µg/g dry weight)

SEDIMENT DATA - Organics (ng/g dry weight)

